

THE AGRICULTURE ANGLE: EFFECT OF FRAMING AGRICULTURAL
BIOTECHNOLOGY MESSAGES ON ATTITUDES AND INTENT TO PUBLISH WITHIN
THE ELABORATION LIKELIHOOD MODEL

By

COURTNEY ALYSSA MEYERS

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2008

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To my husband, Daniel Meyers

ACKNOWLEDGMENTS

A number of people have contributed to my success in graduate school and the completion of my doctoral degree. I want to first thank my committee members whose individual and collective input made my dissertation research more rigorous and the entire process a worthwhile endeavor. I thank Dr. Maria Gallo who provided a valuable biological scientist's perspective and the content necessary for the message stimuli. I thank Dr. Debbie Treise whose expertise in science communication greatly benefited the conceptual and theoretical framework for the study. I thank Dr. Anna Ball who always asked thoughtful questions and challenged me to more closely evaluate the organization of my arguments. I thank Dr. Ricky Telg for his close editing and attention to detail, which improved my writing and the overall quality of my dissertation. Finally, I thank my committee chair, Dr. Tracy Irani, for her support and encouragement, revision of numerous drafts, and continual advice to improve my ability as a researcher and future faculty member.

I have benefited from working in an extraordinary academic department that values graduate students and provides numerous opportunities for their success. I thank Jodi DeGraw who always had an answer to every question and was eager to help me through any situation requiring paperwork. I thank the wonderful support staff, Holly O'Ferrell and Rachel Harris, who make the department "run." I always enjoyed visiting with them both and I know they sincerely care about the students in the department. Finally, to Dr. Edward Osborne, I want to extend my sincere gratitude for both financial and personal support during my time in Florida. The advice and insight he provided in Faculty Roles class was extremely beneficial in helping me obtain a faculty position and my preparation to become an assistant professor. I thank him for all he does to make the department a wonderful place to earn a graduate degree.

Although three years in graduate school can seem like a never-ending sequence of writing papers and taking exams, it is the friends I have made that helped that time fly by and leave me with mixed feelings as I move on. I thank all my fellow graduate students, past and present, who made this experience so enjoyable. I especially thank Emily Rhoades for her guidance as my mentor in the department and Shannon Arnold for her valuable advice and entertaining conversations. I look forward to many collaborative research projects together as friends and colleagues. I also want to thank many other fellow graduate students – Wendy Warner, Elio Chiarelli, Brian Estevez, Katy Groseta, Christy Windham, Ann DeLay, Lauri Baker, Robert Strong, Marlene von Stein, Rochelle Strickland – who made me laugh and relax despite any level of stress. I thank Katie (Chodil) Abrams who has been my classmate, teaching partner, research collaborator, and friend. I could always count on her to share my accomplishments or struggles. Finally, I thank Carrie Pedreiro and her husband, Michael Pedreiro, for their most treasured friendship. They are wonderful role models of a loving couple and dedicated parents.

I thank two people whose early influence helped me get this far. I thank Dr. Jefferson Miller, my master's adviser at the University of Arkansas, who encouraged me to consider working toward a Ph.D. when the thought had never crossed my mind. I also thank Mr. Bill Johnston, my high school FFA advisor, who exposed me to the diverse possibilities available in agriculture and helped channel my competitive spirit and drive for success.

My respect for education and love of learning was encouraged from an early age by my parents, Gary and Sheila Wimmer. I thank them for establishing high standards and providing the support necessary to realize my educational goals. I also thank my grandmother, Dorothy Wimmer, who fostered an appreciation for agriculture and demonstrated what a good work ethic truly is. I thank my dearest friend since conception, my twin sister, Gaea Wimmer, who I could

always count on to listen to my problems and share in my victories. Twins truly do share a special bond and I am extremely grateful to have her as my sister.

The result of this effort and my doctoral education is shared with one very special person in my life, my husband Daniel Meyers. I could have never completed this degree without his constant encouragement and understanding. I thank him for taking care of chores and other responsibilities so I could concentrate on schoolwork or attend research conferences. He and our sweet dog Dash have been a source of great joy during any obstacles I faced. As we start the greatest adventure in our lives as parents to Isabel, I know he will continue to be my best friend and love of my life.

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LIST OF DEFINITIONS

Agricultural Biotechnology	Agricultural biotechnology is a range of tools, including traditional breeding techniques, that alter living organisms, or parts of organisms, to make or modify products; improve plants or animals; or develop microorganisms for specific agricultural uses (USDA, 2005, para. 1).
Attitude	A psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor (Eagly & Chaiken, 1993, p. 1).
Elaboration	Degree to which an individual cognitively processes issue-relevant arguments within a persuasive communication (Petty & Cacioppo, 1986).
Framing	To select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described (Entman, 1993, p. 52).
Issue Involvement	The amount of importance recipients give to a persuasive message (Petty & Cacioppo, 1979).
Need for Cognition	An individual's tendency to engage in and enjoy effortful cognitive endeavors" (Cacioppo, Petty, & Kao, 1984, p. 306).
Newsworthiness	An indication of an event's likelihood to be included in news coverage based on news values such as proximity, impact, timeliness, and conflict (Clayman & Reisner, 1998).
Persuasion	Any instance in which an active attempt is made to change a person's mind (Petty & Cacioppo, 1996, p. 4).
Science Communication	The communication of scientific topics, concepts, or research findings using journalistic practices through mass media, public relations, or informal education such as museums.
Science Reporting	The communication of science-related topics following the conventions of journalist practice.
Scientific Thinking and Educational Partnership (STEP) Program	A multi-dimensional university-based program that assists University of Florida faculty in executing the societal broader impacts of their research, engages students in the sciences, and educates the public at large regarding scientific knowledge and cutting edge technologies (STEP, 2007a, para. 1).

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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By

Courtney Alyssa Meyers

August 2008

Chair: Tracy Irani

Major: Agricultural Education and Communication

Our purpose was to examine the effect persuasive communication has on influencing media coverage of agricultural science, specifically agricultural biotechnology. Agricultural issues are most commonly framed as positive versus negative or risk versus benefit. Using the Elaboration Likelihood Model and framing theory, persuasive communication was achieved through the use of positively framed messages (*health, economics, and scientific progress*) to discover what impact the message frame had on communicators' attitudes toward argument quality and likelihood to publish the information. Today, the media serve as the primary source of scientific information, but do not frequently address agricultural topics, including those that involve controversial science and technology applications. Public relations practitioners in science, including agricultural science, can utilize message frames to shape public opinion through media coverage. However, no empirical research has been conducted regarding the utilization of positive message frames in a persuasive communication model to discover communicators' reactions to agricultural biotechnology news messages.

We examined the situation of framing within the ELM, a dual-route model of persuasion. A 2 (issue involvement: high and low) x 2 (preexisting attitude toward agricultural

biotechnology: more positive and less positive) x 3 (message frames: *scientific progress*, *economics*, and *health*) between-subjects factorial quasi-experimental design was used to test the research hypotheses. Subjects were randomly assigned to receive one of three message frames. The experiment focused on determining whether an individual's issue involvement and attitudes toward agricultural biotechnology, when provided with a specific message frame, influenced resulting attitudes toward argument quality and likelihood to publish agricultural biotechnology news.

Members of the American Agricultural Editors Association (AAEA) and the National Association of Science Writers (NASW) comprised the sample for the study. The final accessible sample included those with active e-mail addresses ($n = 1,240$) with a response rate of 24.8% ($n = 308$).

Overall, results indicated that the interaction of message frame, issue involvement, and preexisting attitude toward agricultural biotechnology was not significant on attitudes toward argument quality or likelihood to publish. However, the main effects were significant for the independent variables on attitudes toward argument quality, but not likelihood to publish. Those with more favorable preexisting attitudes toward agricultural biotechnology had higher mean scores on attitudes toward agricultural biotechnology. Similarly, those who were high in issue involvement had higher mean scores on attitudes toward agricultural biotechnology. The frame alone also had a significant influence on attitudes toward agricultural biotechnology. Results indicated that the message frames do have some influence on attitudes toward argument quality with the *health* frame as the most influential frame on the dependent variables regardless of issue involvement or preexisting attitude. This study also introduced a potential new index to measure

attitudes toward argument quality as perceived by those in the media. This index was comprised of items from newsworthiness and argument quality indexes.

The theoretical contribution of this study provides additional support for connecting framing and the ELM. How persuasive messages are framed influences attitudes toward argument quality, which is related to the amount of cognitive processing undertaken and the route to persuasion used with the ELM.

CHAPTER 1 INTRODUCTION

The systematic acquisition of food, clothing, and shelter was the earliest form of collective human activity and gave birth to civilization. Industry, art, and science are all products of a civilization founded on and supported by agriculture. Thus, agriculture, directly or indirectly, touches all aspects of human activity (National Agricultural Library, 2002).

American agriculture has a celebrated past with achievements in the distribution of public lands, founding of land-grant colleges, application of science, and federal policy support (Hurt, 2002). According to the most recent U.S. Census of Agriculture, the United States has more than two million farms occupying almost one billion acres, and the annual market value for agricultural products exceeds \$200 billion (United States Department of Agriculture, 2002). In 2000, the agriculture industry provided 25.8 million jobs, which is approximately 15.6% of the total U.S. employment. These jobs include farm production employment, agricultural services, forestry, fishing, equipment manufacturing, and agricultural processing (W.K. Kellogg Foundation, n.d.).

Although agriculture has a significant impact on the U.S. economy and job market, the amount of people directly involved in production agriculture has dropped to less than 1% of the U.S. population (Hurt, 2002). This has led to a U.S. public that has limited understanding as to what agriculture is, what agriculture does, or the future challenges facing the industry. “The significance of changing this view of agriculture, whether it be a perceptual or a realistic one, is critical to U.S. agriculture’s structure, function, and success in the coming years” (National Agricultural Research, Extension, Education, and Economics Advisory Board [NAREEE], 1997, p. 7).

Specific goals to improve the public’s understanding and appreciation of agriculture include increasing scientific literacy among consumers and policy makers, improving confidence in the U.S. food production system, and establishing public understanding and support of

agricultural research and education (NAREEE, 1997). These goals are still in effect today as the public's agricultural literacy, knowledge or understanding of agricultural concepts (Frick, Birkenholz, & Machtmes, 1995), remains low. For example, in 2002 less than 10% of the Florida public understood agriculture's impact on the state economy or the importance of agriculture in general (Florida Department of Agriculture and Consumer Services, 2002).

Historically, American agriculture has gone through a series of revolutions. The first was the integration of horse-powered equipment; the second revolution involved increased use of mechanical power and chemical herbicides, pesticides, and fertilizers. The third revolution in American agriculture at the end of the 20th century was marked by the increased application of science (Hurt, 2002). Agriculture utilizes scientific advances in the life, environmental, and social sciences to advance and improve production practices; to develop new products; to improve nutritional content; to provide environmental benefits; and to enhance biosecurity and food safety (National Research Council, 2003). Advances in science and technology have helped American agriculture become successful through improved production practices and consumer benefits, such as food with a longer shelf life, new flavors, more convenience, and better nutrition (USDA ARS, 2005). Continued research in agriculture strives to discover scientific answers to further advance the industry and meet future needs (Buchanan, 2007). "Science has served as a vitally important foundation for our agricultural system and its ability to provide this nation and the world with its needs for food, fiber, and feed of our livestock" (Buchanan, 2007, p. 1).

As mentioned, the third revolution in American agriculture is characterized by the utilization of innovations in science, specifically in genomics and biotechnology (Hurt, 2002). "A new word, *biotechnology*, reflected the merging of agricultural sciences with engineering and

the promise of improved production” (Hurt, 2002, p. 383). The U.S. Department of Agriculture defines agricultural biotechnology as “a range of tools, including traditional breeding techniques, that alter living organisms, or parts of organisms, to make or modify products; improve plants or animals; or develop microorganisms for specific agricultural uses,” (USDA, 2007, para. 1). Biotechnology also encompasses the tools of genetic engineering or genetic modification (USDA, 2007). As a subset of research in genetics, biotechnology has intrigued both the media and public beginning in the 1970s (Nelkin & Lindee, 1995). Organizations such as the National Academy of Science (NAS) have encouraged the development of a “genetically literate public that understands basic biological research, understands elements of the personal and health implications of genetics, and participates effectively in public policy issues involving genetic information” (Andrews, Fullarton, Holtzman, & Motulsky, 1994, p. 185).

Science and the Public

At a time when the challenges facing humanity are growing rapidly, and when meeting those challenges increasingly depends on scientific research, the need for public support and understanding of science has never been greater. (Holsinger, 2006, p. 955)

An interest and appreciation for science is ingrained in American culture (Miller, 2000). Most American adults (90%) report being very or moderately interested in scientific and technological discoveries (National Science Foundation [NSF], 2006b). However, the attention given to science and technology has not promoted public understanding of the basic concepts that make these innovations possible. Although the percentage of scientifically literate U.S. adults has doubled in the past 20 years, it is low considering the democratic principle of citizen understanding and involvement in policy decisions. By the end of the 20th century, only 17% of U.S. adults were classified as scientifically literate (Miller, 2000). Scientific literacy is related to the public’s ability to understand scientific concepts, including those related to agricultural science endeavors. The appropriate level of understanding to be considered scientifically literate

is the ability to “read and comprehend the Tuesday science section of *The New York Times*” (Miller, 2000, p. 274).

Hacker and Harris (1992) stated that an individual’s formal education in science occurs early in life and “cannot equip the individual for a scientifically literate lifetime in an increasingly technological society” (p. 217). Although science is an emphasized subject in formal education, most Americans continue to struggle to comprehend the foundational concepts of science necessary to interpret current research findings (Miller, 2000). Consequently, the American public is largely illiterate about science (Gregory & Miller, 1998).

Beyond politics, science has an influence on economic and social issues (Nelkin, 1995). Diamond (1997) posited that everyone needs to understand science to help make personal choices regarding health and safety, to guide policy-decisions, to be informed voters, and to support science’s impact on the economy, education system, and society. After the completion of formal education, the majority of people have little exposure to science except through media reports. As Nelkin (1995) explained:

For most people, the reality of science is what they read in the press. They understand science less through direct experience or past education than through the filter of journalistic language and imagery. The media are their only contact with what is going on in rapidly changing scientific and technical fields, as well as a major source of information about the implications of these changes for their lives. (p. 2)

The science information presented in the media is different from what is taught in educational settings. In formal education, people learn “textbook science” that is classified as uncontroversial or established. The media, however, report on “frontier science” that is often uncertain or preliminary (Bauer, 1994). Within agricultural science, an example of “frontier science” includes the application of biotechnology for the recent and future development of “functional” foods that provide nutritional attributes (National Research Council, 2003).

Beginning in the 1980s, interest in defining and discovering the public's understanding of science has initiated a vast number of research endeavors (Bauer, Allum, & Miller, 2007). Defining "public understanding of science" is difficult and often depends on the study's author or authors. In order to operationally define the term, it is often broken into three distinct pieces: public, understanding, and science. "Public" includes almost anyone who might receive information concerning scientific topics, but is most often used to describe a "lay public" of those not directly involved in scientific research. "Understanding" includes both knowledge and appreciation of scientific topics. "Science" is defined as scientific knowledge produced by those recognized as members of the scientific community (Thomas & Durant, 1987). Although defining the public understanding of science is difficult, many people agree that more emphasis on it would be beneficial (Gregory & Miller, 1998). Thomas and Durant (1987) outlined nine benefits that should serve as motivation for improved public understanding of science: (1) benefits to science; (2) benefits to national economies; (3) benefits to national power and influence; (4) benefits to individuals; (5) benefits to democratic government; (6) benefits to society as a whole; (7) intellectual benefits; (8) aesthetic benefits; and (9) moral benefits. The diversity of these benefits illustrate that although many people agree on the need for public understanding of science, the underlying motivations, outlooks, and purposes are varied and distinct.

Science and Media

The mass media serve as the primary source of current scientific information for American adults (Friedman, Dunwoody, & Rogers, 1986; LaFollette, 1990; Nelkin, 1995). Other sources of scientific information such as science classes, science museums, and interpersonal communication exist, but the mass media provide the public with the most access to science-related information (Nisbet et al., 2002). The media are often the only source the public has to

learn about scientific discoveries, events, and controversies. If readers have limited experience or prior knowledge with a scientific topic, they rely on the media to provide an explanation as to what effect scientific findings have on their lives (Nelkin, 1995). Due to the large amount of scientific information available, the public relies on the media, to some degree, to keep them informed of recent advances in scientific pursuits (Zimmerman, Bisanz, Bisanz, Klein, & Klein, 2001).

The most common channels for science information are electronic. The National Science Foundation (2006b) reported television is the most utilized source for science information (41%), followed by other media channels including newspapers (14%), magazines (14%), and radio (2%). The Internet (18%) was the second highest source of science information, which may or may not include online media sources. Additional sources were friends and family (4%), books (5%), and other (2%) (NSF, 2006). Nisbet et al. (2002) concluded that science-specific television programming can positively influence public understanding of science, but the amount of sensational and fictionalized accounts of science (i.e. science fiction, fantasy, or paranormal mystery shows) overwhelm solely educational efforts. Therefore, when education is the primary goal of public outreach of science, the preferred media channel should be print, specifically newspapers and magazines (Nisbet et al., 2002).

A number of internal and external factors influence what is covered in the mass media. Within media organizations, the responsibility of reporting science lies with journalists, who face many challenges when covering scientific topics including news-gathering norms, editorial pressures, uncooperative scientists, and a diverse audience (Treise & Weigold, 2002). External factors include sources, interest groups, public relations campaigns, other media organizations, advertisers, and audiences (Shoemaker & Reese, 1996). When reporting news events, including

science, the media are actively deciding what stories to cover and this process, along with what interpretation the media provide, can influence the public's agenda (Priest, 2001). Science stories are more likely to be covered by the media if they meet certain newsworthy characteristics called news values. In reference to science stories, these news values include threshold or magnitude; meaningfulness, relevance, and consonance to the audience; co-option and composition in terms of what has been published and available space or time; frequency, unexpectedness, and continuity of news items; competition of stories; unambiguity and negativity of information; reliability of facts and sources; and elitism and personalization (Gregory & Miller, 1998).

The scientific process is often ambiguous, complex, and controversial, and these factors lead to ever-present scientific uncertainty, which is created through a limited amount of scientific knowledge or a disagreement about what that knowledge means. Scientific stories that contain some amount of uncertainty are considered newsworthy because of the inherent conflict and controversy. How journalists write about and describe stories containing scientific uncertainty can affect how the audience interprets that information (Friedman, Dunwoody, & Rogers, 1999). Hartz and Chappell (1997) contend that media inattention to complex scientific topics has encouraged a public that is unsupportive of science and technology.

Rogers (1999) identified two characteristics of science reporting that inhibit the audience's ability to understand the scientific topic: lack of information and lack of context. Audience members need basic information to understand the content of a science story. Without this foundation, readers must make assumptions, which may or may not be correct. In regard to the context, audience members want to know how the latest information fits into the larger body of research, what came before, and what is next. The structure and framing of a science news story can also influence how well the audience is able to understand the issue being presented. When

writing about science, journalists should make the stories informative, useful, and understandable, which can be difficult when reporting on controversial or new scientific issues (Rogers, 1999). Journalists' inability to adequately report on science by explaining the context and process of research contributes to the separation between science and public understanding (Nelkin, 1995). The ability of journalists to report on science has implications for the audience:

Good reporting can enhance the public's ability to evaluate science policy issues and the individual's ability to make rational personal choices; poor reporting can mislead and disempower a public that is increasingly affected by science and technology and by decisions determined by technical expertise. (Nelkin, 1995, p. 2)

Agricultural science covers a variety of disciplines and involves a number of stakeholders including scientists, producers, conservationists, and consumers (National Research Council, 2003). Lundy, Ruth, Telg, and Irani (2006) found that agricultural scientists did not believe the public understands either agriculture or its parent sciences. Agricultural scientists also reported a lack of confidence in the public's ability to get necessary information through the news media to understand agriculture or science in general (Lundy et al., 2006).

Despite its significant contribution to America's economic, cultural, and environmental progress, agriculture is often overlooked as a newsworthy topic by the mass media (Stringer & Thomson, 1999). Although no empirical literature could be found regarding dominant agriculture issues in news media, recent coverage of agriculture in U.S. news media focused on topics such as food safety (Schmit, 2008; Shin, 2008), biofuels and rising food prices (Martin, 2008; Sands, 2008), organic food (Rosenwald, 2008; Martin & Severson, 2008), and the U.S. farm bill (Lengell, 2008; Weisman & Morgan, 2008).

Lichter, Amundson, and Lichter (2005) analyzed content from 10 news outlets (print and television) during a six-month period in 2004 to discover how rural life is portrayed. Although the overall number of articles containing "rural" increased 57% from 2002 to 2004, the amount

of farm-related coverage decreased 50%. Agriculture and rural life were rarely associated, with farming mentioned in only 3% of the media coverage (Lichter et al., 2005). Agricultural news coverage may not always be classified as science stories because agriculture, like health communication, involves the use of several news angles, including human interest or business. However, as previously mentioned, agricultural news coverage can include the use of a science news angle.

Journalists who do not regularly report on agricultural news do not provide an accurate description of the industry (Reisner & Walter, 1994). Print stories in general newspapers tend to be superficial and stereotyped. These media sources do not provide in-depth or long-term coverage of agricultural science issues or events. Reisner and Walter (1994) found that general newspapers and farm magazines do not provide consistent or complete coverage of agricultural issues or events that would “increase public understanding of issues facing farmers or farmer understanding of public concerns about agriculture’s environmental and social effects” (p. 535).

Biotechnology is one area of agricultural science that has received a great deal of media coverage, and the media play an important role in shaping public perceptions of this topic (Kalaitzandonakes, Marks, & Vickner, 2004). A recent International Food Information Council study found that although about 75% of consumers have heard or read at least “a little” about food biotechnology, they remain unaware of the prevalence of these types of foods currently in the market (IFIC, 2007). Only 23% of consumers said these products are currently available. Consumer approval for plant biotechnology is greater than that for animal biotechnology, although approval for animal cloning did increase from 19% in 2006 to 24% in 2007. Most consumers (54%) are unsure about the potential of food biotechnology, while one-third said biotech foods will provide some benefits to them and their families. These benefits include better

tasting food, reducing saturated fat content, and increasing healthful fats (IFIC, 2007). The Pew Initiative on Food and Biotechnology (2006) noted that media coverage of agricultural biotechnology has an influence on the public's attention to the issue. After the StarLink™ corn recall in 2001, media coverage about agricultural biotechnology was significant and public awareness was at its highest level. In 2001, 45% of American consumers said they had heard “a great deal” (9%) or “some” (35%) about genetically modified foods, which are developed using the tools of agricultural biotechnology. As media coverage dedicated to genetically modified foods coverage decreased, so too did the public's awareness of the issue. In 2006, 41% of American consumers indicated either hearing “a great deal” or “some” about the topic.

The amount and tone of media coverage has an influence on consumer opinions regarding agricultural biotechnology (Hoban, 1998). In European countries where media coverage has focused less on the benefits and more on the potential risks of this area of agricultural science, survey respondents are generally more negative in their opinions toward agricultural biotechnology (Hoban, 1998). Past research has indicated that U.S. media are generally more positive in their coverage of agricultural biotechnology (Gaskell, Bauer, Durant, & Allum, 1999), but the public perceptions of the quality of newspaper and television coverage of the topic are less supportive with only 44% of respondents indicating the media were “doing a good job for society” (Priest, 2001, p. 940).

Application: Scientific Thinking and Educational Partnership (STEP) Program and Agricultural Biotechnology

United States academic institutions significantly contribute to the scientific research and development conducted nationwide. In 2004, academia dedicated \$42 billion to research and development efforts. The contribution is especially important in the basic sciences of which academia conducts more than half (NSF, 2006a). Academic institutions are also charged with the

mission of providing the results of that research to the public. This is most often conducted through outreach and education programs that help scientists listen to concerns and proactively strive to provide the public with information regarding scientific issues (Leshner, 2007).

To meet the research and development priorities, academic institutions rely on both public and private funding agencies. In 2003, the government funded 60% of the research at academic institutions, and 96% of these funds are from six federal agencies. Beginning in 2001, the NSF, one of the leading funders of academic research, requires grant applicants to demonstrate how they will incorporate broader societal impacts into their research proposal. According to the NSF (2006a), broader impacts include “aspects of teaching and learning, integration of research and education, technology transfer, societal benefits, technological innovation, infrastructure development, and opportunities to include a diversity of participants, particularly from underrepresented groups in science” (p. 17).

Scientists often struggle to develop and include outreach strategies in their grant proposals that can meet the broader impacts criterion of the merit review system (Frodeman & Holbrook, 2007). One reason for this hesitancy may be that scientists are traditionally not trained in how to communicate to or educate the public. Although scientists may want to discuss their work with the public, they are pressured to dedicate their time and energy to conducting more research, securing grants, and publishing in scholarly journals. Leshner (2007) said more should be done to encourage public engagement and outreach training for scientists:

If science is going to fully serve its societal mission in the future, we need to both encourage and equip the next generation of scientists to effectively engage with the broader society in which we work and live (p. 161).

To help address this issue and provide support to scientists when seeking grants with the requirement of broader societal impacts, several researchers at the University of Florida (Gainesville, FL) developed the Scientific Thinking and Educational Partnership (STEP)

Program. STEP works with researchers to write grants and develop strategies to provide research findings to the broader public. In 2007, STEP launched ufgenetics.com, an interactive website that highlights research of faculty associated with the University of Florida's Genetics Institute. The site includes information for the target audiences of teachers and journalists. The teachers' page has feature videos and lesson plans. The journalists' page includes feature videos, print news stories, and photographs in what can best be described as an online newsroom (STEP, 2007b).

When journalists or reporters need to identify story ideas, conduct article research, or locate press releases, they are increasingly relying on the World Wide Web and e-mail ("No One's Yelling 'Copy' Anymore," 2001). The Web has exposed journalists to more story ideas and has created job opportunities that are more directly involved with communication efforts, which "represents a change in the news-making route of science journalism as well as in the dissemination of this content" (Trumbo, Sprecker, Dumlao, Yun, & Duke, 2001, p. 361).

Science public relations practitioners are also utilizing the Web and e-mail to reach the media. Professionals in this career field are "enthusiastic about the Web as a tool that helps persuade journalists to cover their organizations" (Duke, 2002, p. 321). Duke (2002) conducted a study of science public relations practitioners and found almost all respondents said e-mail is essential (66%) or sometimes useful (29%) in media relations. Almost half (47%) of those surveyed routinely or always use e-mail to send press releases to journalists. A majority of practitioners (66%) reported that e-mail has helped increase media coverage of their organization to some degree, and 20% said it has greatly increased coverage (Duke, 2002). Having a Web presence also contributes to increased media coverage. Two-thirds (76%) of respondents said they post press releases on the Web, and 66% said it is easier to receive media coverage with the

use of the Web. Public relations practitioners in science communication utilize the Web for a number of purposes beyond media relations, including tracking issues, crisis communication, rumor control, and education and outreach (Duke, 2002).

Online newsrooms are a critical element organizations need in order to interact with the media (Woodall, 2007). In the 2007 Online Newsroom Survey, all journalists surveyed said it was important for an organization to have an online newsroom, and 98% of the respondents prefer to receive e-mail alerts generated through these newsrooms. Interest in specific online newsroom features, such as photographs, audio, and video, increased when compared to previous years (Woodall, 2007). Additional research is needed to discover journalists' perceptions of the information provided by an organization through an online newsroom format (specifically online news releases) that may persuade them to utilize that information in communication efforts.

Elaboration Likelihood Model

Within the context of the current study, the Elaboration Likelihood Model (ELM) provides a framework to examine the individual variables (need for cognition and issue involvement) and situational variables (argument quality and message frame) that may influence the persuasion process through either the central or peripheral route (Petty & Cacioppo, 1986). The central route to persuasion is based on careful attention to the issue-relevant arguments within a message, and attitudes are formed based on evaluation of these arguments. The peripheral route to persuasion is based less on consideration of the arguments and more on the peripheral cues such as source credibility and graphic elements (Petty & Cacioppo, 1996).

An individual's motivation and ability influence the elaboration likelihood, or the degree to which a person cognitively assesses issue-relevant messages within persuasive communication. Individuals who are highly motivated and have the ability to cognitively process the issue-relevant messages utilize the central route to persuasion. When individuals lack either the

motivation and/or ability to evaluate the issue-relevant arguments, they are persuaded via the peripheral route (Petty & Cacioppo, 1996).

The ELM contains several constructs that influence which route to persuasion an individual is more likely to utilize. One construct is issue involvement, which addresses the amount of importance recipients give to the issue-relevant arguments in a persuasive message. Individuals who are more involved will be more likely to be persuaded through the central route than those who are less involved in the issue (Petty & Cacioppo, 1979). Another construct is the need for cognition, which is a personality trait that influences how much an individual evaluates a persuasive message (Petty, Cacioppo, & Strathman, 2005). The higher an individual's need for cognition, the more likely they will pay attention to the issue-relevant messages and utilize the central route to persuasion (Cacioppo & Petty, 1982).

Argument quality is another construct that may influence the resulting attitude of a persuasive message. If an individual is motivated and able to use the central route to persuasion, arguments that are seen as strong and compelling will result in more favorable thoughts than those that are interpreted as weak. In contrast, when the peripheral route is utilized, an individual is more likely to depend on preexisting thoughts to form an attitude than issue-relevant arguments (Petty & Cacioppo, 1996). With any given message topic, research is necessary to explore what elements of a persuasive message could influence argument quality and the resulting persuasion process. Through the use of communication theories such as framing, messages could then be developed to purposively draw upon those message elements.

Framing

Framing is a communication strategy used to organize and make sense of information (Goffman, 1974). Framing occurs in a variety of communication contexts, including media representations of information (Scheufele, 1999). Entman (1993) explained that framing helps

organize information by drawing attention to important elements, emphasizing key pieces of information, and ignoring superfluous details. In the media, frames can appear through the inclusion or exclusion of key words and the selection of sources (Entman, 1993). In regard to science information, individuals do not actively think about scientific matters or know how to interpret scientific information; therefore, the media can influence public opinion of science and technology by legitimizing an issue or framing it in a way that will influence resulting public opinion (Priest & Eyck, 2003). Examination of news frames, and any corresponding event that encourages them, offers an opportunity to explore the media's influence on public opinion (Marks et al., 2007).

Several studies have examined media coverage of agricultural biotechnology to discover prominent frames. Upon review of the literature, two frames in particular seemed to appear frequently in studies that included media coverage in a variety of leading newspapers in the United States and abroad – “economic costs/economic progress/economic” and “scientific progress/progress” (Gaskell et al., 1999; Nisbet & Lewenstein, 2002; Priest & Ten Eyck, 2003; Lundy & Irani, 2004). Crawley (2007) noted that media coverage of agricultural biotechnology has been prominently framed as “scientific progress” and “economic prosperity.” Additionally, the frame of “health” or “health benefits” was noted in several framing analysis studies of media coverage regarding agricultural biotechnology (Gaskell et al. 1999; Kohring & Matthes, 2002; Marks, Kalaitzandonakes, Wilkins, & Zakharova, 2007).

Framing has long been used to research how the media portray any number of issues. However, less research has been conducted on how public relations practitioners can utilize various frames to shape the discourse on a topic or issue. Lundy (2004) conducted an examination of positively framing internal communication messages within the ELM. Results

indicated that positive frames had some influence on attitudes toward internationalizing extension, but more research is necessary to explore the persuasive influence of frames within the ELM (Lundy, 2004).

Public relations practitioners exist in both public and private scientific institutions (including agricultural organizations and institutions) to provide information to the media and encourage coverage of scientific endeavors (Nelkin, 1995). Public relations practitioners can utilize framing when writing news releases and can help influence how chosen topics are portrayed in the media (Knight, 1999). Journalists should be considered as an audience for messages that contain frames because they “are equally susceptible to the very frames that they use to describe events and issues” (Scheufele, 1999, p. 117). More research is needed to investigate if journalists’ frames of an event or issue are a result of how sources have framed the information, or if they rely on other news sources’ framing of the issue (Scheufele, 1999).

Problem Statement

Agricultural science encompasses a variety of scientific disciplines that conduct research for a number of stakeholder groups. Although the public relies on agriculture for food, feed and fiber, public understanding of science and its application in agricultural research pursuits is quite limited. The media serve as the primary source of modern scientific information, but do not give much attention to agricultural topics, including those that involve controversial science and technology applications. One such area of agricultural science that has received media attention is agricultural biotechnology, due to the inherent uncertainty surrounding new applications of this science.

Public relations practitioners in science, including agricultural science, can utilize message frames to shape public opinion through media coverage. However, no empirical research has been conducted regarding the utilization of positive message frames in a persuasive

communication model to discover communicators' reactions to agricultural biotechnology news messages. The purpose of this study was to examine what effect persuasive communication has on influencing media coverage of agricultural science, specifically agricultural biotechnology. Persuasive communication was achieved through the use of positively framed messages (*health, scientific progress, or economics*) to discover what impact the message frame had on communicators' attitudes toward argument quality and likelihood to publish the information.

RQ1: When exposed to a specific positively valenced news frame, to what extent do issue involvement and preexisting attitudes toward agricultural biotechnology influence communicators' attitudes toward argument quality of the message?

RQ2: When exposed to a specific positively valenced news frame, to what extent do issue involvement and preexisting attitudes toward agricultural biotechnology influence communicators' likelihood to publish the information?

CHAPTER 2

RELEVANT LITERATURE

The previous chapter established the need for the current study and the research purpose, which was to examine the effect persuasive communication (in the form of positively framed messages) about an application of agricultural biotechnology has on influencing media coverage of agricultural science, specifically agricultural biotechnology. This chapter provides an overview of research related to attitudes and the persuasive communication process with specific emphasis on the ELM and its constructs involved in the current study. The literature review continues with an explanation of framing theory, how framing is used in a variety of communication processes, and an overview of empirical studies that identified common frames utilized in media coverage of agricultural biotechnology. The chapter concludes with an outline of agenda setting and priming theories and how framing theory can be utilized in public relations endeavors.

Attitudes and Persuasion

Eagly and Chaiken (1993) defined attitude as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (p. 1). Attitudes can be held toward what are termed “attitude objects” (Ostrom, Bond, Krosnick, & Sedikides, 1994). These attitude objects can be concrete (i.e. furniture, clothing) or abstract (i.e. socialism, capitalism) and include particular entities (i.e. personal belongings) or behaviors (i.e. voting) (Eagly & Chaiken, 1993).

When measuring attitudes, researchers are concerned with the evaluative property, which is the degree of positive or negative expression toward the attitude object. On the evaluative dimension, attitudes can range from strongly positive to neutral to strongly negative (Ostrom et al., 1994). Because attitudes cannot be directly observed, researchers rely on observable

evaluative responses to infer relevant attitudes. Three specific responses made when sharing attitudes are affective responses, cognitive responses, and conative responses. Affective responses are the emotional feelings connected to thinking or experiencing an attitude object. Cognitive responses are based on beliefs, inferences, knowledge, facts, and assumptions regarding the attitude object. Finally, conative responses are the behaviors or actions taken in response to the attitude object (Ostrom et al., 1994).

Attitudes are an essential construct in persuasion theories because attitudes are predictive of behavior (Stiff, 1994; Petty & Cacioppo, 1996). Perloff (2003) defined persuasion as:

a symbolic process in which communicators try to convince other people to change their attitudes or behavior regarding an issue through the transmission of a message, in an atmosphere of free choice (p. 8).

This definition states that the persuasion process has five criteria: 1) Symbols can be words, images, or nonverbal signs; 2) Persuasion is an intentional, deliberate process; 3) Persuasion is also an internal process to change attitude or behavior; 4) Transmission of a persuasive message can be verbal or non-verbal, interpersonal or via mass media; and 5) Individuals have free-choice regarding how to think or act in response to persuasive communication (Perloff, 2003).

The Yale Attitude Change Approach (Hovland, Janis, & Kelley, 1953) was among the earliest empirical studies on the effects of persuasion communication. The researchers set out to investigate *who* says *what* to *whom* with *what effect*. The Hovland/Yale Model of Persuasion describes persuasion as a learning process where attitude change occurs after a series of steps: attention, comprehension, learning, acceptance, and retention (Hovland et al., 1953). Learning has long been recognized as a part of the persuasion process with the original research assumption that people attend to all the information they receive (Chaiken, Wood, & Eagly,

1996). During the 1950s and early 1960s people were viewed as passive recipients of persuasive communication. This viewpoint changed in the 1960s when more emphasis was given to the active learning process found in cognitive models of persuasion. The learning process indicated that people were able to concentrate on the persuasive message, speaker, or context and generate thoughts to support (proarguments) or challenge (counterarguments) the message (Perloff, 2003).

The Cognitive Response Approach to Persuasion states that a person's cognitive response to a message, more than the message itself, plays an important role in the persuasion process (Petty, Ostrom, & Brock, 1981). This approach places more emphasis on cognitive processing, but has two major limitations. First, the assumption that people always carefully think about messages is not always the case. Second, this approach does not provide adequate explanation of the various ways messages can influence people (Perloff, 2003).

The limitations in the cognitive process approach led to the development of two process-based models of persuasion: the Heuristic-Systematic Model (HSM) (Chaiken, Liberman, & Eagly, 1986; Chaiken et al., 1996) and the ELM (Petty & Cacioppo, 1986). The HSM proposes that persuasion can occur through two processes called systematic and heuristic processing. Systematic processing is characterized by careful attention and examination of issue-relevant arguments. Heuristic processing relies on the use of cognitive shortcuts to assist in the evaluation of persuasion messages (Chaiken et al., 1986). Of the two process-based models, the ELM has been used more extensively in empirical investigations of the persuasion process because its framework provides a more comprehensive explanation to understand communication effects (Perloff, 2003). The following section provides additional description of the ELM and its specific constructs of interest for the current study.

Elaboration Likelihood Model

The ELM states that the amount and type of thinking one does in regard to a persuasive message will influence the result of that persuasion (Petty & Cacioppo, 1986). Elaboration likelihood is determined by variables that affect the *motivation* and *ability* to process a message. Motivational factors address an individual's desire to expend cognitive effort to consider message arguments. Ability factors include those that address whether an individual possesses the knowledge, skills, or opportunity to consider the persuasive message (Petty et al., 2005).

The ELM is comprised of two distinct routes to persuasion: the central route and the peripheral route. In the central route, more attention is given to the information contained in a message. People focus on the message arguments and develop a new understanding or integrate the information with prior knowledge. Attitudes formed via this route are usually rational because people pay attention to the message, make a cognitive effort to interpret the message, and evaluate it. This process may not be completely rational, however, due to preexisting opinions regarding the value of some message arguments (Petty & Cacioppo, 1996).

The other route in the ELM, the peripheral route, is based on less careful consideration of the message arguments. This route focuses less on the quality of the arguments and more on emphasizing peripheral cues. These cues are characteristics or factors present in a message that do not require any cognitive effort on behalf of the issue or object. Peripheral cues work as cognitive shortcuts so people do not have to carefully consider message-relevant information (Petty & Cacioppo, 1996).

An important assumption of the ELM is that people cannot pay attention to every message they encounter. Attention relies on how much motivation or ability one has to attend to a persuasive message. Typically, persuasion occurs when a person receives a message from

another source in a specific setting. This communication message can contain information about an issue, person, or object (Petty et al., 2005).

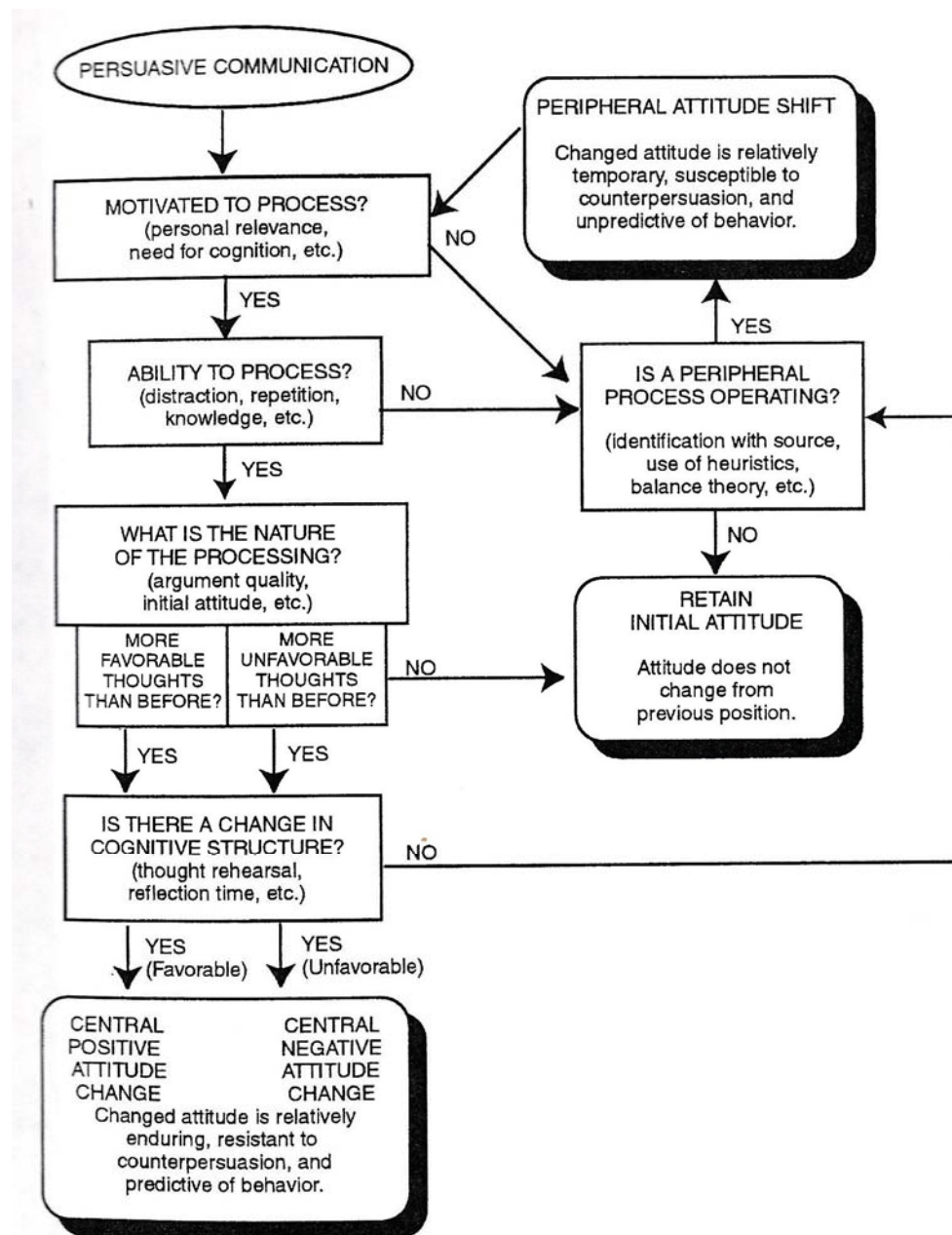


Figure 2-1. The Elaboration Likelihood Model of persuasion (Petty & Wegener, 1999).

Issue Involvement and Personal Relevance

Issue involvement influences the amount of importance recipients give to a persuasive message. The more involved an individual is, the more importance the individual will place on

the issue-relevant arguments in a persuasive message. When involvement is low, an individual will focus less cognitive effort on the message and focus on peripheral cues such as source credibility (Petty & Cacioppo, 1979).

The strength of involvement influences the ability of a persuasive message to encourage thoughts either in support of or against the argument. When a person is highly involved with the message content, counter-arguments are likely to produce adverse thoughts and decreased agreement. However, when the arguments are in agreement with a highly involved individual, the corresponding thoughts will be positive and provide more support to the argument (Petty & Cacioppo, 1979).

Personal relevance to a persuasive message influences what message attributes contribute to its effectiveness. When the persuasive message contains an issue of high relevance, the logic of message arguments contribute to message effectiveness. In a situation of low personal relevance, peripheral cues contribute to the message effectiveness (Petty, Cacioppo, & Goldman, 1981).

People are exposed to countless messages each day. It is impossible and impractical to give attention to every single message (Petty et al., 2005). Therefore, when a message is personally relevant, it becomes worthwhile to expend the mental effort to form an opinion. When the message is not as relevant, people will not be as motivated to expend the energy to form an opinion based on careful examination of the message arguments (Petty, Cacioppo, & Goldman, 1981).

In addition to motivation, the *ability* to process message arguments may vary depending on personal relevance. When a message is highly relevant, people have most likely dedicated cognitive effort to developing knowledge and opinions about the issue and, therefore, have the

ability to evaluate the arguments in a persuasive message. “Any variable that increases the likelihood that people will be motivated and able to engage in the difficult task of evaluating the message arguments increases the likelihood of the central route to persuasion” (Petty, Cacioppo, & Goldman, 1981, p. 854). Alternatively, variables that decrease the motivation and/or ability to evaluate message arguments will encourage persuasion via the peripheral route (Petty, Cacioppo, & Goldman, 1981).

Argument Quality

Petty and Cacioppo (1986) stated that “one of the least researched and least understood questions in the psychology of persuasion is: What makes an argument persuasive?” (p. 31). Fishbein and Ajzen (1981) said that “the general neglect of the information contained in a message...is probably the most serious problem in communication and persuasion research” (p. 359).

Within the ELM, the construct addressing the characteristics of the persuasive message is argument quality. Argument quality deals with the attributes of any information contained in a message that assists in evaluation of the message’s target, which could be an object, person, or issue (Petty & Cacioppo, 1981). The argument quality construct is important because this feature of a persuasive message can influence the resulting thoughts and persuasion route utilized (Petty & Cacioppo, 1996). However, this construct has not received a great deal of attention in ELM studies (Areni & Lutz, 1988).

Petty and Cacioppo (1981) defined argument quality empirically through the development of “strong” and “weak” arguments. A “strong” message contains message arguments that upon evaluation lead to favorable thoughts (in agreement with the message). A “weak” message contains message arguments that elicit unfavorable thoughts when recipients think about them. During the message development process specific arguments are also checked for believability to

develop plausible strong and weak arguments. The final step is to pre-test the messages for comprehensibility, complexity, and familiarity (Petty & Cacioppo, 1986).

Argument quality is incorporated in the ELM because this construct has some influence on which route to persuasion is more likely to be utilized. The central route to persuasion is characterized by more cognitive effort than the peripheral route. Message elaboration via the central route occurs when a message recipient has both the motivation and ability to attend to a persuasive message. In this route, a message recipient pays attention to messages, attempts to understand them, and evaluates them. The description of that persuasion is then determined primarily by the recipient's subjective evaluation of the message's argument quality. This process is not entirely objective because message recipients integrate these messages into their existing knowledge base and the resulting opinion of the message may differ among recipients. If the recipient evaluates the message as containing strong and effective arguments, then additional thought about the message will lead to more favorable thoughts and lasting persuasion; however, if the message arguments are perceived as weak, additional thought will lead to counterarguments and the possibility that the recipient will move in the opposite direction of the position advocated in the persuasive communication (Petty & Cacioppo, 1996).

In instances when a person is either unable or unmotivated to think about a persuasive message, the peripheral route to persuasion is utilized. As discussed previously, a recipient's issue involvement and personal relevance influence persuasion. If a person is high in issue involvement but does not understand the message arguments (or arguments are absent), elaboration cannot occur because a recipient must first attend and comprehend the message. Without attention and comprehension of the message arguments, elaboration is not possible. When this is the case, the recipient can still develop thoughts regarding the *issue* based on the

subjective quality of the arguments and preexisting attitudes (Petty & Cacioppo, 1996). A more positive preexisting attitude will lead to additional favorable thoughts and strengthening of the initial attitude while a more negative preexisting attitude will encourage unfavorable thoughts and a more negative attitude (Tesser, 1978). This indicates that when a person lacks either the motivation or ability to think about the message-relevant arguments, the resulting thoughts will be determined more by preexisting attitudes than the arguments in the message (Petty & Cacioppo, 1996).

Although argument quality is often manipulated pre-exposure to develop a “strong” and “weak” message treatment, in the current study argument quality will be operationalized and empirically evaluated using three distinct frames – *scientific progress*, *economics*, and *health* (further explained below). This study will utilize attitudes toward argument quality to provide an objective measure of newsworthiness, which is a subjective measure of news quality.

Events that make it into the news often do so because journalists see these events as “newsworthy” (Fishman, 1980; Tuchman, 1978). A diverse set of characteristics influence newsworthiness (Oliver & Myers, 1999). As Meyers (1997) explained, the construct of newsworthiness is complex and multi-dimensional:

Newsworthiness...qualities journalists believe make an event worth reporting...has never been easy to define. There are no hard-and-fast rules about what constitutes the news, and reporters and editors themselves are often vague about how they separate what to cover from what to ignore within the vast pool of occurrences that could, potentially, be news. (p. 18)

Fundamental news value criteria include human interest, prominence of the issue, number of people affected, controversy or conflict, uniqueness, proximity, timeliness, and locality (Shoemaker & Reese, 1991). Schmierbach (2005) utilized the news values of timeliness, significance, and relevance of readers to develop a newsworthiness index. Findings indicated that newsworthiness was a reflection of journalists’ individual perceptions and this variable is

important when exploring the gatekeeping decision process regarding what information is eventually reported on or published.

Need for Cognition

Some people evaluate messages regardless of whether or not they need to, while others will evaluate a message only when they absolutely must. This personality trait is called the need for cognition (Petty et al., 2005). Need for cognition influences “the persistence and resistance of newly formed or changed attitudes” (Haugtvedt & Petty, 1992, p. 317). Need for cognition is a motivating factor that influences which persuasion route message recipients will use (Cacioppo, & Petty, 1982).

Individuals who are high in need for cognition are more concerned with the quality of information than those who are lower in need for cognition (Petty et al., 2005) and develop opinions that are more persistent over time and more resistant to change (Haugtvedt & Petty, 1992). Cacioppo, Petty, and Kao (1984) developed an 18-item scale for need for cognition that measures the intrinsic motivation one possesses to partake in cognitive effort.

Framing

Framing occurs every day as a function of individuals’ cognitive attempts to organize life experiences and help make sense of them. A frame is used to take a situation that would otherwise not be meaningful and communicate it in a different way that gives it meaning (Goffman, 1974). Frames are structures found in culture to organize understanding of social phenomena (Hertog & McLeod, 2001). In communication, framing helps organize information by drawing attention to important elements, emphasizing key pieces of information, and ignoring superfluous details. Entman (1993) said:

To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal

interpretation, moral evaluation, and/or treatment recommendation for the item described.
(p. 52)

Frames can appear in four distinct phases of the communication process: the communicator, text, receiver, and culture. Relevant to the creation of news frames, *communicators* make deliberate or unintentional decisions when deciding what to say. As Entman (1993) explained, the *text* of a communication process can also contain frames. These frames are formed through inclusion or exclusion of key words, phrases, images, sources, and sentences that reinforce a theme. How the *receiver* interprets frames may or may not reflect the original intention of the communicator when the frame was established. Finally, an individual's *culture* provides an inventory of common frames shared by people in a social grouping. The appearance and attention to frames at each of the phases of the communication process promotes a shared function to highlight information, develop arguments about a problem, and subsequently focus on causation, evaluation, and/or solution.

Framing involves selection and salience. When a piece of information is emphasized, it increases the audience member's perception of salience, which is how noticeable, meaningful, or memorable a piece of information is to the audience (Entman, 1993). Hertog and McLeod (2001) outline five applications of frames: to determine what content is relevant to discussion of a concern; to define the roles of stakeholders, to outline relevant beliefs, actions, and values; to determine the language used to discuss the topic; and to outline the values and goals of the content area.

In regard to frames in news coverage, "a frame is a central organizing idea for news content that supplies a context and suggests what the issue is through the use of selection, emphasis, exclusion, and elaboration" (Tankard, Hendrickson, Silberman, Bliss, & Ghanem, 1991, p. 11). Within media content, frames can be identified in a number of "focal points:" (1)

headlines and kickers, (2) subheads, (3) photographs, (4) photo captions, (5) leads, (6) selection of sources or affiliations, (7) selection of quotes, (8) pull quotes, (9) logos, (10) statistics, charts, and graphs, and (11) concluding statements or paragraphs of articles (Tankard, 2001). Journalists rely on frames to filter large amounts of information, determine what is important, and efficiently communicate that information to their audiences (Gitlin, 1980). “The news frame organizes everyday reality and the news frame is part and parcel of everyday reality...[it] is an essential feature of news” (Tuchman, 1978, p. 193). Thus, how the media chooses to select and present issues may impact how audience members interpret the event (Price, Tewksbury, & Powers, 1997).

Scheufele (1999) synthesized several approaches to framing research and developed a process model of framing. This model divides framing into four processes: “frame building; frame setting; individual-level effects of framing; and a link between individual frames and media frames” (p. 114). The frame building process addresses how media frames are developed, and Scheufele (1999) states that more research is needed to examine how journalists select frames or make changes to existing frames. Specifically, more work is needed to determine what individual characteristics, organizational factors, or external sources may influence how news content is framed.

The frame setting process is similar to agenda setting (McCombs & Shaw, 1972) or more specifically, second-level agenda setting (McCombs, Llamas, Lopez-Escobar, & Rey, 1997). While agenda setting addresses the salience of issues through examination of the coverage and placement of news events, second-level agenda setting is concerned with the salience of issue attributes (McCombs et al., 1997). Second-level agenda setting refers to the tone of news coverage and attributes given to issues or individuals. The emphasis given to the specific

attributes within news coverage connects this theoretical work to framing theory. McCombs (1997) stated that “framing is the selection of a restricted number of thematically related attributes for inclusion on the media agenda when a particular object is discussed” (p. 37). Despite the similarities of framing and second-level agenda setting, Scheufele (2000) affirmed that framing is a distinct theory because it deals with the subtle changes in wording that may affect how the audience thinks about the topic, while agenda setting (including second-level agenda setting) is based on the concept of attitude accessibility. Fazio (1989) defined attitude accessibility along a continuum based on the strength of an association between an object in memory and an individual’s evaluation of that object. The media, through coverage or non-coverage, have the ability to influence both the issue and attribute salience of topics, thereby influencing attitude accessibility (Scheufele, 2000).

The individual-level effect of the framing process is concerned with behavioral, attitudinal, and cognitive variables that influence the outcome of framing. Media frames have been found to influence the amount of importance individuals’ assign to covered issues (Nelson, Clawson, & Oxley, 1997). Empirical work has described the effects of media framing on individual variables, but has not provided explanation as to why or how the variables are connected. Iyengar (1991) explored how “episodic” and “thematic” frames impact viewer’s attributions of responsibility for political issues, but it is unknown what role audience framing played in the framing process.

The link between individual and media frames relates to how journalists respond to the frames utilized to describe events and issues. This aspect of the framing process is concerned with the influence that existing frames such as those from sources, interest groups, and elites have on journalists’ use of frames (Scheufele, 1999). Through examination of crime news

coverage, Fishman (1980) found that journalists are susceptible to media frames in which a frame first utilized by a small number of news media was soon adopted by other media.

In print or broadcast news, frames provide the “angle” for a story. News frames can provide a theme or style that would appeal to the audience, and potentially influence opinions or judgments of the news topic (Stone, Singletary, & Richmond, 1999). Price et al. (1997) stated news frames can influence readers’ opinions and thoughts because readers’ cognitive responses varied depending on how the news story was framed. Framing also influenced how readers evaluated the presented messages by activating knowledge relevant to the frame. This finding indicates that frames can act as prompts for what knowledge audience members need to utilize to evaluate the message (Price et al., 1997).

News frames have been used and studied in a number of contexts such as politics (i.e. Rhee, 1997; Semetko & Valkenburg, 2000), violence (i.e. Husselbee & Elliot, 2002), international news (i.e. Entman, 1991), and health (i.e. Lawrence, 2004). One of the areas of research in which news frames have been shown to be particularly relevant is in the area of scientific issues (Einsiedel, 1992; Nelkin, 1995; Trumbo, 1996). Empirical studies have explored the frames present in news media coverage of nanotechnology (i.e. Stephens, 2005), environmental risks (i.e. Griffin & Dunwoody, 1997; Anderson & Marhadour, 2007), genetics (i.e. Ten Eyck & Williment, 2003), and agriculture (i.e. Ashlock, Cartmell, & Kelemen, 2006; Ruth, Eubanks, & Telg, 2005).

Framing Biotechnology

Biotechnology is an area of science that has received a great deal of attention from communication scholars. Prior to the 1970s, biotechnology referred to applications in food processing and agriculture. Since that time, it has expanded to incorporate a broader definition of biological research using laboratory techniques (Bunders, Haverkort, & Hiemstra, 1996). Beyond

agricultural and food science, biotechnology has been applied to medical, industrial, and environmental uses.

A number of studies have been conducted to examine what types of frames are utilized in mass media coverage of this topic. Nisbet and Lewenstein (2002) found an increase in agricultural biotechnology coverage in *The New York Times* and *Newsweek* from 1970 to 1999. Despite a few cases of negative coverage, the overall tone was positive. Prominent frames included “economic costs” and “scientific progress.” A recent study of frames utilized in the *Washington Post*, the *Sunday Times*, and the *London Times* found that medical biotechnology was portrayed more approvingly than agricultural biotechnology. Although the researchers identified benefits of agricultural biotechnology including health, environmental, social, humanitarian, and economic, the media examined in their study utilized frames that emphasized the risks associated with agricultural applications of biotechnology over the benefits (Marks et al., 2007).

Gaskell et al. (1999) examined news coverage of agricultural biotechnology in the United States and Europe and also found the dominant frames of “progress” and “economic prospect” as well as a dominant theme of “health” regarding applications of agricultural biotechnology. In an examination of how agricultural biotechnology was framed in German media from 1992 to 1999, Kohring and Matthes (2002) discovered early emphasis on the economic, health, and environmental advantages and disadvantages of biotechnology applications, which was defined as the “Agri-Food: Pros & Cons” frame. Lundy and Irani (2004) examined U.S. and British print media coverage of agricultural biotechnology, and identified several prominent frames: contamination of the food supply, human risk, environmental risk, scientific progress, and world hunger.

Priest and Ten Eyck (2003) analyzed news media coverage of biotechnology in the United States, Canada, and 14 European countries. Eight prominent frames were identified: progress, economic, ethical, Pandora's box, runaway technology, nature/nurture, public accountability, and globalization. Several of these frames focused on presenting the benefits and risks of agricultural biotechnology. The progress (or progressive) frame was the most identified frame in 11 of the countries and was at least in the top three in all countries. When this frame was utilized, only 8% of the articles mentioned the likelihood of a risk while 58% mentioned a potential benefit. The economic frame was the third most popular frame overall. When it was identified as the dominant frame in news coverage of biotechnology, 16% of the articles focused on the likelihood of risks, while 48% mentioned benefits (Priest & Ten Eyck, 2003).

Framing and the Elaboration Likelihood Model

In the ELM, research regarding argument quality has explored the influence of utilizing positively and negatively framed messages to encourage persuasion (Petty & Wegener, 1998). Health communication research has investigated which message frames are most effective in persuading individuals to change behavior and have focused on negative versus positive frames (Maheswaran & Meyers-Levy, 1990) or benefits versus costs frames (Rothman & Salovey, 1997).

Maheswaran and Meyers-Levy (1990) examined how a negative or positive message frame influenced persuasion at different levels of issue involvement. The context of this study was a preventative health issue (high cholesterol) and addressed how message frames and issue involvement may jointly influence attitudes toward acceptance of an advocated behavior. Results indicated that when respondents had low issue involvement, the positively framed message arguments were more persuasive than negative message framing. Alternatively, when issue

involvement was high, respondents reported the negatively framed messages were more persuasive (Maheswaran & Meyers-Levy, 1990).

Donovan and Jalleh (2000) also explored the use of positively and negatively framed persuasive messages in the context of attitudes toward immunization of infants. Respondents with low-issue involvement were more persuaded through positive framing of messages, consistent with the Maheswaran and Meyers-Levy (1990) finding. However, no framing effect was found for respondents with high levels of issue involvement indicating that either frame choice would be equally successful in the persuasion process (Donovan & Jalleh, 2000).

These studies provide empirical support for the use of frames in the development of persuasive communication; however, the use of positive versus negative frames may not always be the most practical option in persuasive communication campaigns. In political persuasive campaigns, issue framing is a fundamental component that influences attitudes and opinions. Nelson and Oxley (1999) conducted two experiments to explore different frames for policy problems (land development dispute and welfare reform). Drawing from discourse on the topics, the frames utilized to present the land development dispute were “environmental preservation” versus “economic growth.” The second study with the welfare reform context used “personal responsibility” versus “protecting children’s well-being” issue frames. In both experiments, the frame influenced opinions regarding the issue and significantly affected evaluations about the importance of different beliefs for each policy area (Nelson & Oxley, 1999).

Lundy (2004) conducted another study of the influence of two positively valenced message frames: “mutual benefit” and “moral norms.” Findings indicated that the message frames influenced cognitive processing, which may indicate a salience effect, but issue involvement and need for cognition influenced attitudes more than the message frames alone (Lundy, 2004). More

research regarding how events are framed in the media can provide additional understanding of how public opinion is guided and formed as a result of news coverage (Marks et al., 2007).

Agenda Setting and Priming

In addition to framing, agenda setting and priming are distinct communication theories that share some similarities in the underlying cognitive process and effects (Weaver, 2007). Agenda setting basically describes the media's ability to tell people what to think about through the selection and coverage of certain issues or events (McCombs & Shaw, 1972). The agenda-setting hypothesis is related to cognitive psychology because it is concerned with the importance people place on certain issues and how that salience is reached (Severin & Tankard, 1992). Funkhouser (1973) found a strong relationship between the public's ranking of important issues and the amount of coverage these issues received in the media. This finding supported the agenda-setting hypothesis, but also raised a causal question of whether the media sets the public agenda or if the public is setting the media agenda.

Agenda setting can be further divided into two levels. The "first level" of agenda setting is concerned with the salience given to "objects," which have characteristics or attributes that describe them. The "second level" of agenda setting emerged when more attention was given to connecting agenda setting research with other communication theories such as framing (McCombs, 2005). The similarity of second-level agenda setting and framing lies in the emphasis on how issues are portrayed in the media rather than what issues are presented to a greater or lesser extent (Weaver, 2007). Theoretically, agenda-setting focuses on *which* issues are covered, while framing research studies *how* issues are reported (Tankard, 2001).

Whereas framing research investigates the selection and presentation of issues in the media, priming research investigates the mental processing of information supplied via the mass media (Stone et al., 1999). Iyengar and Kinder (1987) found that when evaluating political

candidates, people rely on heuristics and cognitive shortcuts. People use available knowledge to make decisions or form opinions instead of actively thinking about all the information. The media assists in priming through the emphasis on certain topics or issues that then “prime” the public to form opinions.

Public Relations and Framing

Knight (1999) states that public relations practitioners already utilize framing as a tool when writing news releases and developing internal communications. “Public relations practitioners occupy positions ideally suited for framing issues in a way likely to advance both public and organizational interests” (Knight, 1999, p. 384). When framing is used consistently over time, these practitioners can help benefit the organizational goals and address complicated social problems (Knight, 1999).

Public relations practitioners use news releases to provide information to the media, to suggest story ideas, and give names of sources for use in news articles. Studies have found a limited, but discernable, impact of public relations practitioners’ ability to utilize frames to shape the media’s message (Barnett, 2005). More skillful crafting (i.e. framing) of messages from organizations may influence how journalists frame news and the resulting public opinion. “Framing may offer a way for public relations professionals to challenge journalistic narratives; to present views ignored or derided by the mainstream press; to correct perceptions; and, ultimately, to redefine issues for their publics” (Barnett, 2005, p. 358).

Framing is integral to the practice of public relations because “the establishment of common frames of reference about topics or issues of mutual concern is a necessary condition for effective relations to be established” (Hallahan, 1999, p. 207). Although framing research has been increasing in popularity for several decades, little attention has been given to the role of public relations as a source in news framing (Hallahan, 1999).

Dunwoody (1992) said the use of frames is crucial to journalists because they allow for quick recognition and minimize mental effort. Public relations practitioners can assume the role of “frame strategists who strive to determine how situations, attributes, choices, actions, issues, and responsibility should be posed to achieve favorable outcomes for clients” (Hallahan, 1999, p. 224). When suggesting information for news, public relations professionals attempt to frame the story to meet the news outlet’s preferred framing. Skilled practitioners are able to package the information in ways to meet the journalists’ expectations for news value, content, and flow. In turn, journalists attempt to present an issue using frames that will resonate with their perceptions of the audience (Hallahan, 1999).

Summary

The review of literature outlined in this chapter provided an overview of research regarding the persuasive communication process and specific application of the ELM. Current gaps in knowledge illustrate a need to further explore how agricultural communicators can utilize the ELM and framing theories to improve media coverage and public awareness of agricultural biotechnology.

CHAPTER 3 RESEARCH DESIGN AND METHODS

Overview

As demonstrated in Chapters 1 and 2, the American public has a limited understanding of agricultural issues, and the amount of people directly involved in agriculture and natural resources continues to decrease. Without direct exposure to agriculture, the public will tend to increase its reliance on news media reports for knowledge about pertinent agricultural science issues. However, journalists' ability to report on scientific endeavors, including agricultural scientific applications, is hampered due to a number of individual and organizational constraints. To assist journalists who are reporting on complex agricultural topics, communicators need to effectively provide messages to the media that contain newsworthy information in an easily accessible format.

Therefore, the purpose of this study was to determine the effect of message framing on: 1) communicators' attitudes toward the argument quality, and, 2) likelihood to publish a specific science application, agricultural biotechnology. To conduct this study, attitudes toward argument quality were assessed within the framework of the ELM. Message framing has a rich research history and has received some attention in connection with persuasive communication theories such as the ELM. However, these empirical studies often present information using opposite frames such as positive vs. negative or benefits vs. costs while situations exist where communicators attempt to get positive messages in the media about agricultural issues or events. Thus, more research is needed to explore the salience of positively valenced frames and the influence on relevant attitudes or behaviors regarding these issues. Through investigation of how message framing influences attitudes of argument quality and likelihood to publish science

related agricultural information, communicators will be better equipped to reach journalists, and the broader public, with positively valenced messages.

Research Questions and Hypotheses

The current study seeks to address the following research questions:

RQ1: When exposed to a specific positively valenced news frame, to what extent do issue involvement and preexisting attitudes toward agricultural biotechnology influence communicators' attitudes toward argument quality of the message?

RQ2: When exposed to a specific positively valenced news frame, to what extent do issue involvement and preexisting attitudes toward agricultural biotechnology influence communicators' likelihood to publish the information?

Based on the above research questions, the following research hypotheses were developed:

H1: Attitudes toward argument quality of a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.

H2: Attitudes toward likelihood to publish information presented in a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.

H3: Subjects who are high in issue involvement and are presented with the *scientific progress* frame will have more favorable attitudes toward argument quality than those who are low in issue involvement and receive either the *economics* or *health* frames.

H4: Subjects who have more positive attitudes toward agricultural biotechnology and are presented with the *scientific progress* frame will have more favorable attitudes toward argument quality than those who have less positive attitudes toward agricultural biotechnology and receive either the *economics* or *health* frames.

H5: For those who receive the *scientific progress* frame, subjects who are high in issue involvement will have more favorable attitudes toward argument quality than subjects who are low in issue involvement.

H6: For those who receive the *health* frame, subjects who are low in issue involvement will have more favorable attitudes toward argument quality than subjects who are high in issue involvement.

H7: A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the *scientific progress* frame will explain the greatest variance in attitudes toward argument quality.

H8: A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the *scientific progress* frame will explain the greatest variance in likelihood to publish the information.

Research Design

This study utilized a 2 (issue involvement: high and low) x 2 (preexisting attitude toward agricultural biotechnology: more positive and less positive) x 3 (message frames: *scientific progress*, *economics*, and *health*) between-subjects factorial quasi-experimental design. Subjects were randomly assigned to receive one of three message frames using an online random number generator. The experiment focused on determining whether an individual's issue involvement and attitudes toward agricultural biotechnology, when provided with a specific message frame, influenced resulting attitudes toward argument quality and likelihood to publish agricultural biotechnology news (Figure 3-1).

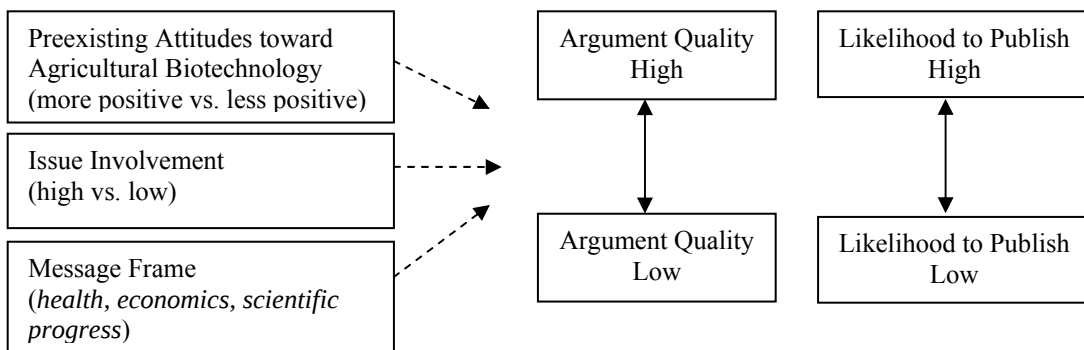


Figure 3-1. Operational framework for the current study.

A factorial design was chosen in order to determine the effect of two manipulated independent variables on the dependent variables, and the interaction among the variables (Ary, Jacobs, & Razavieh, 2002). In this posttest-only, randomized subject design quasi-experiment: R = random assignment; O₁ = posttest measures; X₁ = *scientific progress* frame, high issue involvement, and more positive attitude; X₂ = *scientific progress* frame, high issue involvement,

and less positive attitude; X_3 = *scientific progress* frame, low issue involvement, and more positive attitude; X_4 = *scientific progress* frame, low issue involvement, and less positive attitude; X_5 = *economics* frame, high issue involvement, and more positive attitude; X_6 = *economics* frame, high issue involvement, and less positive attitude; X_7 = *economics* frame, low issue involvement, and more positive attitude; X_8 = *economics* frame, low issue involvement, and less positive attitude; X_9 = *health* frame, high issue involvement, and more positive attitude; X_{10} = *health* frame, high issue involvement, and less positive attitude; X_{11} = *health* frame, low issue involvement, and more positive attitude; and X_{12} = *health* frame, low issue involvement, and less positive attitude. The group design is as follows:

R	X_1	O_1
R	X_2	O_1
R	X_3	O_1
R	X_4	O_1
R	X_5	O_1
R	X_6	O_1
R	X_7	O_1
R	X_8	O_1
R	X_9	O_1
R	X_{10}	O_1
R	X_{11}	O_1
R	X_{12}	O_1

The research design took into account a number of threats to internal and external validity. Internal validity addresses the extent to which changes in the dependent variable can be

attributed to the independent variable(s) within an experimental situation. Ary et al. (2002) outline a number of threats to internal validity. The post-test only research design of the current study, combined with random assignment of subjects, addressed the threats of history, maturation, pretesting, regression, mortality, and selection-maturation interaction. Measuring instruments can be a threat to internal validity. This threat was addressed by using a panel of experts to establish face validity and pilot-testing the instrument for construct validity. The messages were also developed using a panel of experts and two rounds of message testing. No changes were made to the instrument during the timeframe of the experiment, which could have introduced a threat to internal validity.

Other threats to internal validity are experimenter and subject effects. The use of an online instrument reduced the experimenter effect because this reduced any influence of the researcher's personal characteristics on subjects. Subject effects such as the Hawthorne effect and John Henry effect were reduced because subjects completed the experiment in their own setting, and although subjects were aware they were completing an online survey, they most likely were not aware they were participating in an experiment due to the unobtrusive nature of data collection. The final potential threat to internal validity was diffusion in which subjects in one group may communicate with those in another group regarding the experiment. This threat was addressed by not emphasizing that an experiment was being conducted or that people may have received different message frames (Ary et al., 2002).

In addition to threats to internal validity, the research design also accounted for a number of threats to external validity such as population validity, ecological validity, and validity of operations (Ary et al., 2002). Population external validity addresses the ability to generalize the results of a sample to a larger population. The target population for the current study includes

communicators in science and agricultural content areas. The experimentally accessible population includes members of two professional organizations (explained in more detail below). In the current study, it is possible to generalize from the study sample to the experimentally accessible sample because all members of the organizations were included and randomly assigned to message conditions (Christensen, 2001).

Ecological validity refers to the environment in which the research was done. This threat to external validity was reduced because subjects completed the online instrument in their real world environment instead of a laboratory setting (Ary et al., 2002; Christensen, 2001). The final threat to external validity is the validity of operations, which was addressed by providing operational definitions and details of the procedure to improve the likelihood that similar results could be obtained in the future with different researchers or measurement procedures (Ary et al., 2002).

Subjects

The population for this study includes communicators in both science and agricultural science content areas who are members of the American Agricultural Editors Association (AAEA) and the National Association of Science Writers (NASW). As of January 2008, AAEA had 238 members classified as “active” who work on the editorial staff of agricultural publications across the nation with an e-mail address contact. AAEA members who were classified as “affiliate,” “student,” or “honorary” were not relevant to the study and were not included in the sample. The 2007 NASW directory included the names of 2,181 individuals with e-mail addresses. A thorough examination of these names indicated 1,167 people who were listed as staff reporters, editors, and freelance journalists in the United States. This list does not include research journal editors, retirees, university professors, or public information officers. Previous studies with communicators and journalists indicate the need to over-sample in order to

reach an appropriate sample size based on poor response rates (Schmierbach, 2005). Therefore, the accessible sample of all 237 members of AAEA and 1,167 members of NASW who fit the sampling frame were included in the study for a total sample size of 1,404. From the initial e-mail sent to all subjects, 164 (11.7%) were returned due to inaccessible addresses after two attempts (23 from AAEA, 141 from NASW). This was determined to be an inaccessible group in the sample. After removing the invalid addresses, the final accessible sample size was 1,240. From this sample, 362 started the survey, but 54 had to be removed due to incomplete responses resulting in a final response rate of 24.8% ($n = 308$). In respect to each organization, response rates were 35.0% ($n = 75$) for AAEA and 21.0% ($n = 215$) for NASW. Eighteen respondents included in the study (5.8%) said they did not belong to either organization although their contact information was located in one of the membership directories.

Subjects were randomly assigned to one of the three message groups, which helped mitigate the influence of extraneous variables. Random assignment improves internal validity because each subject has an equal chance of being assigned to any group and any confounding variables are distributed in the same way (Wimmer & Dominick, 2003). The groups differed by the message frame – *scientific progress*, *economics*, and *health*.

Message Stimuli

The experiment in this study was designed to test message stimuli. Subjects were randomly assigned (with the use of a random number generator) to one of three messages about peanut allergen research. The topic of the messages was based on actual research conducted at the University of Florida and featured by the Scientific Thinking and Educational Partnership (STEP) Program. The researcher quoted in the message, Dr. Maria Gallo, assisted in the message development and approved each version for accuracy. Each of the messages (see Appendix D) was presented using a press release format with masthead, dateline, contact information (which

was left unassigned), Associated Press style, and the inverted pyramid style of news writing. The purpose of the message was to look close enough to an actual press release without using an actual contact person who might be contacted for additional information.

Each of the messages presented a frame, two of which were positively valenced (*scientific progress* and *economics*) while the third acted as a conditional control (*health*). The conditional control message was developed to contain factual information to resemble the way this type of information is commonly presented. Identified as a dominant theme and benefit of agricultural biotechnology applications (Gaskell et al., 1999; Marks et al., 2007), the *health* message contained a human interest lead about someone with peanut allergies and continues with details about the prevalence of this type of allergy, foods to avoid, and one quote from the researcher. The headline read: “Recent study explores possibility of allergen-free peanuts.” This frame did not provide any specifics about the research process or future research endeavors.

The *scientific progress* frame has been identified as a dominant frame in news media coverage of agricultural biotechnology (Gaskell et al., 1999; Nisbet & Lewenstein, 2002; Priest & Ten Eyck, 2003; Lundy & Irani, 2004; Crawley, 2007). The message developed that utilized this frame highlighted the research process and used keywords or phrases such as “breakthrough,” “paving a new path,” “progress,” “discovery,” and “future investigation.” The message also featured step-by-step organization to highlight the research process. The headline for this message read: “Scientific breakthrough may lead to allergen-free peanuts.” The researcher explained the research process and what the findings mean for future research.

Also identified as a dominant frame in news coverage of agricultural biotechnology (Gaskell et al., 1999; Nisbet & Lewenstein, 2002; Priest & Ten Eyck, 2003; Crawley, 2007), the *economics* frame emphasized the impact the development of allergen-free peanuts may have on

the peanut industry. The headline read: “Work on allergen-free peanuts may lead to substantial economic growth for \$800 million peanut industry.” This message utilized a number of keywords or phrases including “economics,” “supply and demand,” “sales,” “growth,” and “peanut commodity market.” The researcher provided her opinion about what this research may mean for the peanut industry and how commodity representatives are involved in the research project. All three messages were revised by a panel of experts and pre-tested with professional communicators. A manipulation check was also included in the final instrument.

Message Stimuli Testing

To pre-test the message frames, 162 members of the Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences (ACE) who are involved in the Writing Special Interest Group (SIG) received one of three messages (see Appendix B). ACE is a professional organization of communicators and information technologists who work in a variety of positions for universities, government agencies, and private companies. Members of the ACE Writing SIG were chosen due to their expertise and experience in writing and editing press releases. Three messages were developed to exhibit a *health*, *economics*, or *scientific progress* frame. In the first round of message testing, respondents were asked to read a randomly assigned press release then list the main topic of the message. The *health* frame was initially developed to serve as a conditional control so it was not provided as a frame option. Following several more questions, respondents were provided with a list of possible options to describe the frame: *economics*, *scientific progress*, neither, or don’t know. Less than half of the respondents correctly identified their assigned message frame (48.7%, n = 19). Using comments from the respondents, messages were further refined to be more distinct, especially between the *health* and *scientific progress* frames.

In the second round of message testing, respondents were randomly assigned to receive one of the three message treatments and provide quantitative and qualitative feedback regarding the message topic or frame. Respondents were asked to select a provided message frame that they would use to describe the press release: *economics*, *scientific progress*, *health*, or don't know. The *health* frame was included as an option after the first round of message testing indicated the possibility that respondents wanted to choose the "best" option instead of choosing "neither." The messages showed improvement in testing with 73.5% (n = 25) of the respondents selecting the correct message frame (Table 3-1).

Table 3-1. Frequency of Subjects Correctly Identifying the Message Frame

	Main Frame of Message	N	%
Round 1	Economics	6	50.0
	Scientific Progress	12	92.3
	Control	1	.1
	Total	19	48.7
Round 2	Economics	7	70.0
	Scientific Progress	10	76.9
	Health	8	72.7
	Total	25	73.5

In the second round of message testing, respondents were asked to evaluate the argument quality of the message using a 10-item index of attributes measuring on a semantic differential scale. A one-way ANOVA found no significant difference between the three message frames ($F_{2,33} = .43$, $p = .66$) indicating that the respondents found them to be the same in argument quality regardless of the identified frame.

Independent Variables

This study has three independent variables – one of which was manipulated. The message frame was manipulated so as to specifically focus on the *scientific progress*, *economics*, or *health* (the conditional control) frame. The other independent variables are issue involvement and

attitudes toward agricultural biotechnology. Issue involvement was not manipulated, but was measured as a preexisting disposition using instrumentation to indicate whether a subject was high or low in involvement. The final independent variable of attitude toward agricultural biotechnology was also not manipulated. It was measured as a preexisting disposition for the purposes of comparison.

Message Frame

For the purpose of the study, three press releases were prepared regarding the same agricultural biotechnology news story about the development of an allergen-free peanut. This context was selected because it is an area of biotechnology that includes both human and plant aspects. The Scientific Thinking and Educational Partnership (STEP) featured this research area in its outreach endeavors.

Within the press releases, the key information was consistent in all versions, but certain facts were emphasized or de-emphasized to utilize a specific frame. Manipulation checks during a preliminary round of message testing were conducted to establish the messages as distinct and identifiable by frame. As explained previously, the two treatment message frames (*scientific progress* and *economics*) were selected based on a review of the literature (Gaskell et al., 1999; Nisbet & Lewenstein, 2002; Priest & Ten Eyck, 2003; Lundy & Irani, 2004; Crawley, 2007). The conditional control frame (*health*) was selected because it has been identified as an important theme in news media coverage of biotechnology (Gaskell et al., 1999) and benefit of agricultural biotechnology (Marks et al., 2007).

Issue Involvement

Issue involvement affects the amount of importance and attention individuals give to a persuasive message. The level of involvement influences what message elements (i.e. issue-relevant arguments, peripheral cues, etc.) a message recipient attends to and what thoughts are

developed as a result of the persuasive message (Petty & Cacioppo, 1979). Issue involvement was not purposively manipulated in this study although it is assumed that members of the two organizations (AAEA and NASW) may have different levels of issue involvement. Two different groups were used in order to ensure there would be some variation in issue involvement. Within the context of this study, communicators who regularly cover issues related to agriculture or agricultural biotechnology are hypothesized to have higher levels of issue involvement. Conversely, individuals who do not report on agriculture or agricultural biotechnology issues regularly will have less personal relevance or issue involvement.

This variable was measured using Zaichkowsky's (1994) Personal Involvement Inventory for Advertising (PIIA) scale (cited in Bearden & Netemeyer, 1999). The 10-item PIIA scale was adapted from Zaichkowsky's (1985) original 20-item Personal Involvement Inventory (PII) scale. The purpose of the PII scale is to measure a person's perceived rational and emotional relevance toward an advertisement or object through assessment of interests, values, and needs (Zaichkowsky, 1985). The revised scale was selected *a priori* in an effort to minimize the time needed to complete the entire instrument. The PIIA presents an individual with the product of research interest followed by 10 semantic differential items, each measured on a 7-point scale (a 5-point scale was used in the current study). The opposing adjectives include items such as "Important" versus "Unimportant" and "Irrelevant" versus "Relevant." Individuals then indicate the level of personal relevance to the object by marking along the 7-point scale for each semantic differential item. The PIIA scale has a reported reliability alpha coefficient ranging from .68 to .95 with a unidimensional structure in factor analysis (Zaichkowsky, 1994).

Attitudes toward Agricultural Biotechnology

Two separate indices were used to measure the third independent variable of attitudes toward agricultural biotechnology. On the first measure, respondents indicated their attitude to

the statement: “I feel agricultural biotechnology is.” This index used a five-point semantic differential scale with six bipolar adjective pairs: *foolish/wise*, *wrong/right*, *unacceptable/acceptable*, *unfavorable/favorable*, *bad/good*, and *negative/positive*. Wood (2006) adapted this index from Burgoon, Cohen, Miller, and Montgomery (1978) to determine attitude toward agricultural biotechnology with an alpha reliability coefficient of .95.

The second attitude index included seven belief statements derived from an original 20-item list of arguments and counterarguments utilized by Wood (2006). Respondents were asked to indicate their level of agreement from strongly disagree to strongly agree to each of the belief statements. No alpha reliability coefficient was provided in the original study for the 20-item index.

In addition to preexisting attitudes toward agricultural biotechnology, respondents also indicated their attitude toward the message topic (peanut allergen research) after receiving the message treatment. This variable was measured using the same six-item semantic differential index used to gather preexisting beliefs.

Dependent Variables

Argument Quality

Petty and Cacioppo (1986) outline several subconstructs of argument quality including believability, comprehensibility, complexity, credibility, and familiarity of the message. Argument quality is often manipulated in studies of persuasive messages, but in the current study this construct is utilized to provide an objective measure of newsworthiness, which is a subjective measure of news quality. To measure attitudes toward argument quality, a 10-item semantic differential scale was utilized to measure subjects’ perceptions of the issue-relevant arguments within the message they received. Seven of the items were adapted from a 10-item index Lundy (2004) utilized to measure argument quality attributes, which was adapted from

several scales (Beltramini, 1982; Thorson, Christ, & Caywood, 1991). These attributes were presented on a semantic differential scale to determine whether messages are perceived as believable, high quality, convincing, credible, reasonable, conclusive, and accurate. The remaining three items were taken from Schmierbach's (2005) index of newsworthiness based on journalists' rating of timeliness, significance, and relevance to readers. This 3-item index had an alpha of .80. Combining the two indices created a 10-item semantic differential index to measure the dependent variable of attitudes toward argument quality. By utilizing attitudes toward argument quality as a determinant of newsworthiness, this study seeks to provide a more objective measure of newsworthiness when communicators are presented with a positively valenced news frame.

Likelihood to Publish

To assess the likelihood a newspaper would publish a story based on information in a press release, Schmierbach (2005) used a 2-item 10-point scale that asked how likely respondents would be to write a story based on the press release and how likely they would be to use a wire story based on the information in the press release. The scores on these items were then averaged to develop an index about the likelihood a newspaper would publish a story based on the information (Cronbach's $\alpha = .72$). These questions were adjusted in the current study to utilize a 5-point scale and an additional question was added to determine the likelihood a respondent would be to seek out a source to write or publish a story.

Attribute Variables

In order to improve the generalizability of research findings, several attribute variables were included in the factorial design (Ary et al., 2002). These variables included age, gender, education, years as a professional in the communications field, position title, type of news publication, circulation of publication, and need for cognition. Need for cognition was measured

using the 18-item Need for Cognition Scale (NCS) with one item removed to improve the reliability coefficient alpha (Cacioppo et al., 1984).

Instrumentation

The instrumentation for this study was distributed via an online survey using SurveyMonkey, which is an online tool used to create, deliver, and analyze online survey questionnaires. Online or Web surveys are the latest development in survey research as they become more frequently utilized. Web surveys are more common due to an increased familiarity and adoption of computers for everyday use as well as increased Internet access. Computer hardware and software make online surveys easier to construct and less expensive to conduct (Dillman, 2007).

Instrument Pilot Test

To determine the instrument's reliability and validity, it was pilot tested in April 2008 with a sample ($n = 111$) of media representatives within the state of Florida who were not members of either AAEA or NASW. Thirty-seven surveys were completed for a 33% response rate.

Prior to disseminating the survey, it was reviewed by a panel of experts for face and content validity. Construct validity was established through the logical approach, which measures each concept within a theory using a set of questions. These questions are piloted and only those with high reliability are used in the final instrument (Black, 1999). Using SPSS® 16.0 for Windows™, item analysis statistics were run to determine the construct validity of each of the scales measuring concepts of interest. In the social sciences, a reliability coefficient of .80 or larger indicates an index is well-constructed and relatively precise (Traub, 1994). This data analysis indicated several necessary changes to the instrument before final distribution.

The 10-item issue involvement index measuring reporting on food and natural resource issues had an alpha reliability coefficient of .89. One item had a corrected item-total correlation

of .37 and was removed from the index. The final version 9-item scale had a reliability alpha of .89 (Table 3-2).

Table 3-2. The PIIA Scale Used to Measure Issue Involvement

I feel that reporting on food and natural resource issues is...						
Important*	1	2	3	4	5	Unimportant
Boring	1	2	3	4	5	Interesting
Relevant*	1	2	3	4	5	Irrelevant
Exciting*	1	2	3	4	5	Unexciting
Means Nothing to Me	1	2	3	4	5	Means A Lot To Me
Appealing*	1	2	3	4	5	Unappealing
Fascinating*	1	2	3	4	5	Mundane
Worthless	1	2	3	4	5	Valuable
Involving*	1	2	3	4	5	Uninvolving
Not Needed	1	2	3	4	5	Needed

Note: *Item is reverse coded. Strikethrough indicates item was removed in final instrument.

To measure pre-existing attitudes toward agricultural biotechnology, two separate indices were piloted. The 6-item index had an alpha reliability of .97 so all items were kept in the final version. The 8-item index had an alpha reliability of .79. One item had a corrected item-total correlation of .37 and was removed. As show in Table 3-3, the final version used a 7-item index with an alpha reliability coefficient of .80.

Table 3-3. The Scale Used to Measure Preexisting Attitudes Toward Agricultural Biotechnology

~~Biotech foods are being forced on U.S. consumers.*~~

Both large and small farmers reap economic benefits from agricultural biotechnology.

Agricultural biotechnology lacks adequate testing.*

Agricultural biotechnology is natural. The process is just faster and more precise than traditional plant breeding.

Biotech foods are in development that will improve human health.

Agricultural biotechnology will help to feed the world's rapidly expanding population.

Biotech crops improve water quality, requiring fewer chemicals than traditional crops.

~~Biotech foods pose unforeseen health risks.*~~

Note: *Item is reverse coded. Strikethrough indicates item was removed in final instrument.

Items measured on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree.

Attitude about the message topic, peanut allergen research, was measured using the same 6-item semantic differential index as preexisting attitudes toward biotechnology. This index had

an alpha reliability of .95 so all items were retained for the final version. Argument quality was measured with a 10-item index that had an alpha reliability of .88. Seven of the items were drawn from Lundy (2004) while the remaining three were added from Schmierbach's (2005) study of newsworthiness. All of the items were retained in the final version. Intent to publish the information contained in the message was measured using a 3-item index with an alpha reliability coefficient of .94. All items had to be retained for the final version to be loaded as an index. The final index utilized in the instrument was need for cognition, which was measured using 18-items. The full index had an alpha reliability of .88, which was improved to .91 by dropping one item (Table 3-4).

Table 3-4. The Scale Used to Measure Need for Cognition

-
1. I would prefer complex to simple problems.
 - ~~2. I like to have the responsibility of handling a situation that requires a lot of thinking.*~~
 3. Thinking is not my idea of fun.*
 4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.*
 - ~~5. I try to anticipate and avoid situations where there is likely change I will have to think in depth about something.*~~
 6. I find satisfaction in deliberating hard and for long hours.
 7. I only think as hard as I have to.*
 8. I prefer to think about small, daily projects to long-term ones.*
 9. I like tasks that require little thought once I've learned them.*
 10. The idea of relying on thought to make my way to the top appeals to me.
 11. I really enjoy a task that involves coming up with new solutions to problems.
 12. Learning new ways to think doesn't excite me very much.*
 13. I prefer my life to be filled with puzzles that I must solve.
 14. The notion of thinking abstractly is appealing to me.
 15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
 16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.*
 17. It's enough for me that something gets the job done; I don't care how or why it works.*
 18. I usually end up deliberating about issues even when they do not affect me personally.
-

Note: *Item is reverse coded. Strikethrough indicates item was removed in final instrument. Items measured on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree.

Instrument Content

The survey was the same for all subjects except for a randomly assigned link to three different versions of the message stimuli (Appendix D), which were presented as Adobe® Acrobat® Portable Document Files. The instrument (Appendix C) was developed as a series of pages to minimize scrolling and was comprised of the following elements:

- Page 1 included the informed consent procedure and online instructions for enabling JavaScript and cookies, which are necessary to access the online survey in SurveyMonkey. This information was provided to overcome any technical difficulties respondents may have encountered.
- Page 2 included three demographic questions asking participants if they were members of AAEA or NASW, their current position title, and what type of news organization they work for. These questions were included at the beginning because they were deemed crucial for data analysis.
- Page 3 included the 9-item Personal Involvement Inventory for Advertising Scale to measure issue involvement to the statement: “I feel that reporting on food and natural resource issues is.”
- Page 4 included the first of two indices to measure attitudes toward agricultural biotechnology. The instructions asked respondents to indicate their attitude to the statement “I feel agricultural biotechnology is” on a series of six bipolar adjective statements.
- Page 5 included the second index to measure attitudes toward agricultural biotechnology. This index asked respondents to indicate how much they agreed or disagreed with seven belief statements.
- Page 6 included a link to the randomly assigned message stimuli and instructions for the subjects to read the message carefully at least twice. The message appeared in a separate window as an Adobe® Acrobat® Portable Document File.
- Page 7 included six comment boxes that allowed respondents to provide their thoughts after reading the message. Questions then asked respondents how important the message was to them personally (measured on a 5-point Likert scale with 1 = not at all important and 5 = very important) and how motivated they were to read the message (measured on a 5-point Likert scale with 1 = not at all motivated and 5 = very motivated). Another question asked respondents to identify the dominant frame or theme in the message as *health*, *economics*, *scientific progress*, or *don’t know*. The final question on this page asked respondents to indicate their level of agreement (on a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree) to the statement: “I believe this press release is newsworthy.”

- Page 8 included an attitude index to measure attitudes toward the message topic of peanut allergen research. The instructions asked respondents to indicate their attitude to the statement “I feel peanut allergen research is” on a series of six bipolar adjective statements.
- Page 9 included the attitudes toward argument quality index comprised of 10 bipolar adjective statements to measure newsworthiness.
- Page 10 included a three-item index to measure respondents’ intent to publish the information contained in the message stimuli. Subjects were asked to indicate 1) how likely they were to utilize the information in the message, 2) if they saw this story on the AP wire service, how likely they would be to publish, and 3) how likely they would be to seek out a source to write or publish a story based on information in the message. These questions were measured using a 5-item Likert scale with 1 = highly unlikely and 5 = highly likely. This index also included a “Not Applicable” response option. The final question on this page asked subjects what their perceived method for receiving a press release was.
- Page 11 included the 17-item need for cognition scale, which was measured using a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree).
- Page 12 was the final page of the survey and included additional demographic questions: year born, gender, highest level of education, years working in the communications field, and publication’s circulation. Respondents were also able to provide additional comments about the survey.

Procedure

To conduct the study, subjects were sent an e-mail with a link to a randomly assigned message treatment. The message treatment was embedded in a news release about agricultural biotechnology in the area of peanut allergen research. The experimental manipulation was based on how the news release is framed – *scientific progress*, *economics*, or *health* as the conditional control. A manipulation check within the instrument determined respondents were able to identify a dominant message frame. Following the framed message, respondents completed a thought-listing measure (Brock, 1967; Greenwald, 1968) in which they recorded any thoughts the message elicited. These thoughts were then coded as favorable, unfavorable or neutral toward the message (Cacioppo, Harkins, & Petty, 1981).

Administration of the survey followed Dillman's (2007) Tailored Design Method with adjustment for an online questionnaire instead of the traditional mail questionnaire. A pre-notice letter was mailed to the sample a few days before they were sent online directions for the survey (see Appendix A). This helped improve perceptions of importance and make the respondents aware of the upcoming e-mail. The letter also included the URL address for the online survey and the subjects' e-mail address where the survey would be sent. This provided respondents an opportunity to access the survey immediately as well as to inform the researcher of any mistake in the provided e-mail address. The actual instrument was then delivered to the sample through an e-mail link to the questionnaire with a randomly assigned treatment or control message frame (see Appendix B-2). This e-mail again emphasized why the respondent's feedback was important and provided incentive to participate in the study. The informed consent process was provided on the first page of the survey instrument. Two weeks after the initial pre-notice letter was mailed, a reminder e-mail with a link to the questionnaire was distributed (see Appendix B-1). A final reminder e-mail was sent 10 days after the first reminder to encourage participation (Dillman, 2007).

Data Analyses

Data analysis for this study was completed using SPSS® 16.0 for Windows™ PC. Cronbach's coefficient alpha was used as an internal-consistency measure of reliability. This measure is used with Likert type questions when a score can take on a range of values (Ary et al., 2002). Three-way and two-way factorial analysis of variance (ANOVA) were used to address the research hypotheses. Black (1999) states that this design can be more comprehensive in its examination of the main factors and possible interactions. This statistical procedure is more economical than other one-way designs and features the same amount of power. This type of

data analysis enhances external validity by making it possible to generalize to realistic settings (Black, 1999).

Additional analysis of the hypotheses utilized multiple linear regression to further explore the relationship between each dependent variable and the independent variables. The coefficient of multiple determination (R^2) was used to explain the difference in each dependent variable attributed to the independent variables. Finally, factor analysis procedures were utilized in *post hoc* analysis to examine groups of questions and their suitability to develop several indexes (Black, 1999).

CHAPTER 4 RESULTS

Overview

Utilizing the ELM and framing theory, the purpose of this study was to determine the effect of message framing on: 1) communicators' attitudes toward the argument quality, and, 2) likelihood to publish information regarding a specific science application. In this research, the message was about the application of agricultural biotechnology to develop an allergen-free peanut. The information was delivered via an online press release format to members of the American Agricultural Editors Association (AAEA) and the National Association of Science Writers (NASW). Guided by the ELM and research hypotheses, the key three independent variables were preexisting attitudes toward agricultural biotechnology, issue involvement, and message frame. The two dependent variables of interest were attitudes toward argument quality and likelihood to publish the information within the press release message.

This chapter provides an analysis of the data beginning with sample demographics, then moves to analysis of the variables of interest, which include issue involvement with reporting food and natural resource issues, preexisting attitudes toward agricultural biotechnology, and attitudes toward argument quality and likelihood to publish. Next, the chapter continues with a discussion of scale reliabilities utilized to develop the indexes that measure the independent and dependent variables. This is followed by an overview of manipulation checks, then tests of the hypotheses are provided. The chapter concludes with a series of *post hoc* analyses.

Descriptive Analysis

Using online survey development and administration software, the 77-item questionnaire was administered to the accessible sample of 237 members of AAEA and 1,167 members of NASW who fit the sampling frame for a total sample size of 1,404. After removing the invalid e-

mail addresses, the final accessible sample size was 1,240 and 308 questionnaires were completed for a 24.8% response rate. The response rate for AAEA was 35.0% ($n = 75$) and NASW had a 21.0% ($n = 215$) response rate.

Potential Error

Dillman (2007) describes four types of error that can occur when conducting surveys: sample, coverage, measurement, and nonresponse. Sampling error is created when a proportion, and not all, of the population is sampled. To address this possibility, all members of the population who met the guidelines of the sampling frame were included in the study. The next type of error that can occur is coverage error, which is possible when the list used to draw the sample does not include all members of the population. The current study does have a limitation due to coverage error because the sample included only members of the organizations who had e-mail addresses listed in the membership directories. Those members who did not have e-mail addresses were not included in the accessible sample and may have differences from those in the study.

Measurement error, the third type of survey error, occurs when the questionnaire is poorly constructed or questions are difficult for the sample to answer. To address this potential error, a panel of experts was used to establish face validity and the instrument was pilot tested to develop construct validity. The final type of error is nonresponse error, which happens when a significant portion of the sample does not respond to the survey and may be different than those who do respond (Dillman, 2007). The current study had a final response rate of 24.8% and falls within the range of response rates reported in previous studies that have surveyed journalists or communicators using online instruments (Arant & Anderson, 2001; Cassidy, 2005; Chung, Kim, Trammell, Porter, 2007). To account for potential nonresponse bias, early responders were compared to late responders on key demographic characteristics including organization

membership, current position title, type of news organization for which they work, gender, age, education, years working in the communications field, and their publication's circulation.

Early responders (n = 250) were defined as those who completed the survey prior to the first reminder e-mail. Late responders (n = 58) were those who completed the survey after the first or second follow-up e-mail. In a study with NASW members, Yun and Trumbo (2000) found that 80% of responses to an e-mailed survey were collected within three days of sending the initial e-mail demonstrating a similar skew toward early responses.

Chi-square statistics compared the early and late responders on a number of demographic characteristics (Table 4-1) and an independent samples t-test compared the groups on age (Table 4-2) to determine if the proportion of responders in the early and late categories were significantly different. No significant difference was found between early and late responders on gender, education, years in communication profession, position, several news organization categories, publication circulation, and age. Results indicated a significant difference between the responder groups in terms of membership (p value = .05) and those who work in a communication department (p value = .03). As anticipated, the difference between the membership categories may be attributed to how salient the research topic was to individuals. These two groups were chosen to ensure some variation in issue involvement and AAEEA members may have found the topic of peanut allergen research to be more closely related to their interests.

The other significant difference between the early and late responder groups was those who worked in communication departments with many more replying earlier than later. This difference may be because responders could identify themselves in more than one category of

news organization. These differences in responder groups do introduce a limitation to the study and a potential nonresponse bias.

Table 4-1. Characteristics of Early and Late Survey Respondents

		Early Respondents		Late Respondents		X ²	p value
		N	%	N	%		
Membership	American Agricultural Editors' Association	66	28.1	9	16.4	3.19	.05
	National Association of Science Writers	169	71.9	46	83.6		
Gender	Male	105	44.3	23	41.8	.11	.43
	Female	132	55.7	32	58.2		
Education	Some college to bachelor's degree	97	40.6	22	38.6	.08	.45
	Graduate or professional degree	142	59.4	35	61.4		
Years in Communication Profession	Less than 3 years	7	2.9	2	3.5	2.12	.83
	3-5 years	28	11.7	5	8.8		
	6-10 years	30	12.6	10	17.5		
	11-15 years	30	12.6	7	12.3		
	16-20 years	25	10.5	8	14.0		
	More than 20 years	119	49.8	24	43.9		
Position Title	Freelance	136	55.1	38	66.7	6.57	.36
	Writer for single publication	25	10.1	6	10.5		
	Editor for single publication	45	18.2	8	14.0		
	Public relations practitioner	7	2.8	3	5.3		
	President or owner	3	1.2	0	0		
	Other	31	12.6	2	3.5		

Table 4-1. Continued

		Early Respondents		Late Respondents		X ²	p value
		N	%	N	%		
News Organization	Daily newspaper	29	11.6	5	8.6	.43	.35
	Weekly newspaper	20	8.0	2	3.4	1.47	.18
	Weekly magazine	22	8.8	7	12.1	.59	.29
	Monthly magazine	123	49.2	29	50.0	.01	.51
News Organization	Online journalism	104	41.6	17	29.3	2.98	.06
	Broadcast journalism	16	6.4	5	23.8	.37	.36
	Communication department	31	12.4	2	3.4	3.94	.03
	Public relations	12	4.8	3	5.2	.01	.56
Publication Circulation	Less than 19,999	18	7.6	4	7.1	3.28	.66
	20,000-49,999	16	6.8	1	1.8		
	50,000-74,999	14	5.9	2	3.6		
	More than 75,000	41	17.4	13	23.2		
	Work for more than one publication	131	55.5	32	57.1		
	Other	16	6.8	4	6.8		

Table 4-2. Independent Samples T-Test to Compare Age of Early and Late Survey Respondents

	Early Responders		Late Responders		t	df	p value
	Mean	SD	Mean	SD			
Age	49.63	13.40	51.28	11.87	-.83	281	.41

Additional comparison of the early and late responders utilized independent samples t-tests to compare the two responder groups' scores on the independent variables of issue involvement

and attitudes toward agricultural biotechnology. As shown in Table 4-3, no significant differences were indicated.

Table 4-3. Independent Samples T-Test for Significant Differences Between Early and Late Respondents

	Early Respondents			Late Respondents			t	df	p value
	N	Mean	SD	N	Mean	SD			
Issue Involvement	235	4.24	.56	54	4.22	.52	.34	287	.74
Preexisting Attitudes toward Agricultural Biotechnology	243	3.98	.84	55	3.85	.84	1.05	296	.29

Demographics

Demographic characteristics collected in the survey included: gender, age, education, years working in the communications field, organization membership (AAEA or NASW), type of news organization, current position title, and publication circulation (Table 4-4). Several demographic questions have missing responses because they were included at the end of the instrument and some respondents did not complete the survey in its entirety. Descriptive analysis indicated 164 female respondents (53.2%) and 128 male respondents (41.6%). Respondents' ages ranged from 22 to 85 years old with a mean age of 49.9 years.

The majority of respondents had a graduate or professional degree (57.5%, n = 177) and 37.7% (n = 116) had at least a four-year bachelor's degree. Three (1.0%) responded that they had at least some college. Nearly half of the respondents (46.8%, n = 144) had worked as a professional in the communications field for more than 20 years. The remaining respondents exhibited a range of years of experience from less than three years (2.9%, n = 9), three to five years (10.7%, n = 33), six to 10 years (13.0%, n = 40), 11 to 15 years (12.0%, n = 37), and 16 to 20 years (10.7%, n = 33).

Seventy-five respondents were members of AAEA (24.4%) and 215 respondents (69.8%) were members of NASW. The remaining respondents (5.8%, n = 18) indicated they were not members of either organization, introducing some potential for coverage error. At the time the study was conducted, the most current membership directories were utilized to develop the sample. However, these respondents may have chosen to leave the organizations since the directories were made available.

Respondents worked for a variety of news organizations and could choose more than one response due to the possibility of freelance writers working with a number of clients. The greatest number of respondents worked for a monthly magazine (49.4%, n = 152). The next highest category was online publication (39.3%, n = 121) followed by a daily newspaper (11.0%, n = 34), communication division/department (10.7%, n = 33), weekly magazine (9.4%, n = 29), weekly newspaper (7.1%, n = 22), broadcast (6.8%, n = 21), and public relations (4.9%, n = 15). In addition, 95 respondents (30.8%) provided “other” responses including freelance, quarterly magazines, non-profit organizations, and book publishers.

Respondents worked in a variety of positions, but the majority (58.4%, n = 180) described themselves as freelance writers who work for more than one client. Other positions represented in the sample included: editor for single publication (17.2%, n = 53), writer for single publication (10.1%, n = 31), public relations practitioner (3.2%, n = 10), or president or owner (1.3%, n = 4). Positions in the “other” category were identified as broadcast journalist (1.9%, n = 6), editor for several publications (1.3%, n = 4), working in a communication division as a writer or editor (1.0%, n = 3), multimedia developer (.6%, n = 2), and the remaining 11 respondents’ positions (3.6%) were those who perform a variety of tasks that could not be labeled with one position title or had unique titles that could not be categorized.

The final demographic characteristic collected was circulation of publication. Due to the large percentage of respondents who were freelance writers, the majority of respondents (52.9%, n = 163) could not provide a circulation number. The remaining respondents worked for publications with more than 75,000 (17.5%, n = 54), followed by publications with less than 19,999 circulation (7.5%, n = 23), circulation of 20,000-49,999 (5.5%, n = 17), and circulation of 50,000-74,999 (5.2%, n = 16). Respondents in the “other” category worked for online publications (1.3%, n = 4) or broadcast radio or television (1.0%, n = 3). Five respondents (1.6%) said they did not know or could not provide this information. The remaining respondents (2.3%, n = 7) said the question was not applicable or provided numbers that could not be identified as online, viewership, or circulation.

Table 4-4. Characteristics of Survey Respondents

		N	%
Membership	American Agricultural Editors’ Association	75	24.4
	National Association of Science Writers.	215	69.8
	Neither	18	5.8
Gender	Male	128	41.6
	Female	164	53.2
Education	Some college to bachelor’s degree	119	38.6
	Graduate or professional degree	177	57.5
Years in Communication Profession	Less than 3 years	9	2.9
	3-5 years	33	10.7
	6-10 years	40	13.0
	11-15 years	37	12.0
	16-20 years	33	10.7
	More than 20 years	144	46.8

Table 4-4. Continued

		N	%
Position Title	Freelance	180	58.4
	Writer for single publication	31	10.1
	Editor for single publication	53	17.2
	Public relations practitioner	10	3.2
Position Title	President or owner	4	1.3
	Broadcast journalist	6	1.9
	Multimedia	2	.6
	Communication division writer or editor	3	1.0
	Editor for several publications	4	1.3
	Other	11	3.6
News Organization	Daily newspaper	34	11.0
	Weekly newspaper	22	7.1
	Weekly magazine	29	9.4
	Monthly magazine	152	49.4
	Online journalism	121	39.3
	Broadcast journalism	21	6.8
	Communication department	33	10.7
	Public relations	15	4.9
	Other	95	30.8
Publication Circulation	Less than 19,999	23	7.5
	20,000-49,999	17	5.5
	50,000-74,999	16	5.2
	More than 75,000	54	17.5
	Work for more than one publication	163	52.9
	Online	4	1.3
	Broadcast	3	1.0
	Don't Know	5	1.6
	Other	7	2.3

In addition to demographic characteristics, respondents were asked to provide their preferred method for receiving press releases. The majority of respondents prefer online methods, specifically e-mail (71.8%, $n = 221$), websites (13.3%, $n = 41$), and RSS feeds (1.9%, $n = 6$). Only 5.5% ($n = 17$) prefer receiving press releases via mail and no respondents indicated fax as a preferred method. In addition, seven (2.3%) respondents said they do not want to receive press releases.

Issue Involvement

Issue involvement was measured using Zaichkowsky's (1994) Personal Involvement Inventory for Advertising (PIIA) scale (cited in Bearden & Netemeyer, 1999). The 10-item PIIA scale was adjusted to 9-items after pilot testing revealed improvement of the reliability alpha by removing one item. Using a 5-point semantic differential scale, respondents indicated their response to each item. In order to test the research hypotheses, a mean split was conducted to establish two groups (high and low) based on average issue involvement scores. The mean for this scale was 4.24 resulting in 141 low issue involvement respondents ($M = 3.78$, $SD = .42$) and 148 high issue involvement respondents ($M = 4.67$, $SD = .22$). An independent samples t-test indicated a significant difference between the two groups' issue involvement scores ($t = -22.84$, $p = .00$).

Preexisting Attitudes Toward Agricultural Biotechnology

To determine preexisting attitudes toward agricultural biotechnology respondents indicated their response to "I feel agricultural biotechnology is..." using six bipolar adjectives (foolish/wise, unacceptable/acceptable, unfavorable/favorable, wrong/right, bad/good, negative/positive) on a 5-point scale. Responses were then summed and averaged to develop the attitude scale. Respondents were classified as more positive or less positive in their average attitude responses using a mean split of 3.96, resulting in 115 less positive attitude respondents

(37.3%) and 183 more positive attitude respondents (59.4%). An independent samples t-test indicated a significant difference between the two groups' attitude scores ($t = -25.65$, $p = .00$). The mean response for the less positive group was 3.08 ($SD = .52$) while the mean response for the more positive group was 4.51 ($SD = .43$). Further exploration of the data indicated no significant difference in attitudes toward agricultural biotechnology between high and low issue involvement respondents ($t = -1.53$, $p \text{ value} = .13$).

Agricultural Biotechnology Belief Statements

Following the six-item scale to determine preexisting attitudes toward agricultural biotechnology, respondents were asked a series of seven belief statements regarding agricultural biotechnology. Using a 5-point Likert scale, respondents indicated their agreement to each statement from 1 (strongly disagree) to 5 (strongly agree). Subjects gave the belief statement, "Agricultural biotechnology will help to feed the world's rapidly expanding population," the highest overall mean of 3.82 ($SD = .96$). The lowest mean was 2.85 ($SD = 1.11$) for the belief statement, "Agricultural biotechnology is natural. The process is just faster and more precise than traditional plant breeding." Table 4-5 displays the means for each statement organized by high and low issue involvement. Independent samples t-tests to compare the responses for high and low issue involvement respondents found no significant differences on any of the belief statements.

Attitudes Toward Message Topic

After reading the randomly assigned message treatment, respondents were asked a series of questions to determine their attitude regarding the message topic about peanut allergen research. Respondents were asked to indicate their response to "I feel peanut allergen research is..." using six bipolar adjectives on a 5-point Likert scale. The response categories were the same as those used to determine preexisting attitudes toward agricultural biotechnology. Responses were

summed and averaged to develop the attitude scale. The mean score was 4.36 (SD = .70) indicating more positive attitudes overall toward the message topic.

Table 4-5. Agreement with Agricultural Biotechnology Belief Statements

	High Issue Involvement			Low Issue Involvement		
	N	Mean	SD	N	Mean	SD
Both large and small farmers reap economic benefits from agricultural biotechnology.	148	3.28	1.13	141	3.40	.97
Agricultural biotechnology lacks adequate testing.*	147	2.98	1.10	141	2.96	1.01
Agricultural biotechnology is natural. The process is just faster and more precise than traditional plant breeding.	148	2.86	1.13	141	2.86	1.12
Biotech foods are in development that will improve human health.	148	3.72	.91	141	3.71	.89
Agricultural biotechnology will help to feed the world's rapidly expanding population.	148	3.81	1.07	140	3.89	.81
Biotech crops improve water quality, requiring fewer chemicals than traditional crops.	148	3.44	.96	140	3.48	.83
Biotech foods pose unforeseen health risks.*	147	2.91	.97	141	2.99	.92

Scores based on Likert scale with 1 = strongly disagree and 5 = strongly agree. *Item was reverse coded.

Likelihood to Publish

Respondents were asked a series of three questions to measure the likelihood the information within the message would be published. The items used a 5-point Likert scale with 1 being highly unlikely and 5 being highly likely with an option to respond “not applicable.” Table 4-6 displays the descriptive statistics for the individual statements. The scores for these questions

were then summed and averaged to create the likelihood to publish index. Overall, the mean score for this index was 2.48 (SD = 1.26) indicating a low intent to publish the information contained in the message.

Table 4-6. Descriptive Statistics for Likelihood to Publish

	N	Number of not applicable	Mean	SD
How likely would you be to utilize the information in the press release to write or publish a story?	274	29	2.32	1.37
If you saw this story on the AP wire service, how likely would you be to publish the information?	244	59	2.51	1.36
How likely would you be to seek out a source to write or publish a story based on the information in the press release?	270	33	2.63	1.40

Scores based on Likert scale with 1 = highly unlikely and 5 = highly likely.

Need for Cognition

For the purposes of the current study, need for cognition (NFC) was evaluated as an attribute variable. The original 18-item scale was adjusted to 17 items following pilot testing, which revealed an improvement in Cronbach's alpha with the deletion of one item. Respondents indicated their agreement to the 17 items on a 5-point Likert scale where 1 indicated strongly disagree and 5 indicated strongly agree. Due to the length of this index and its placement at the end of the instrument, it was not completed by all respondents (273 subjects completed the index). Average NFC scores ranged from 1.82 to 5.00 with a mean score of 3.95. For the purpose of describing respondents, a mean split was used to categorize respondents as high or low in need for cognition, which resulted in 146 (47.4%) low need for cognition respondents who

scored below the mean and 127 (41.8%) high need for cognition respondents who scored at or above the mean. An independent samples t-test indicated a significant difference between the two groups ($t = -20.38, p = .00$).

The ELM Scales

Within the framework of the ELM (Petty & Cacioppo, 1986), several scales were utilized to determine the underlying constructs of issue involvement, attitudes toward argument quality, and need for cognition. The current study used issue involvement and attitudes toward agricultural biotechnology as independent variables while attitudes toward argument quality was a dependent variable. Need for cognition was an attribute variable that was not included in the hypothesis testing process.

Issue Involvement Scale

In the current study, issue involvement was measured using Zaichkowsky's (1994) Personal Involvement Inventory for Advertising (PIIA) scale (cited in Bearden & Netemeyer, 1999). Following pilot testing, the 10-item PIIA scale was adjusted to nine items to improve the reliability alpha. Using a 5-point semantic differential scale, respondents indicated their response to each of the nine items. The scale had a range of standard deviations from .52 to .96 demonstrating some variance in the data for this scale. The discrimination index for the items included in the issue involvement scale (Table 4-7) showed the corrected item-total correlation ranged from .44 to .73. The corrected item-total correlation measures the correlation between each item and the overall summated index score. The alpha reliability coefficient for the entire index was $\alpha = .87$ and would not be improved by removing any item. Therefore, the grand mean for the issue involvement scale was 4.24 ($SD = .55$).

Table 4-7. Personal Involvement Inventory for Advertising (PIIA) Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Important/Unimportant*	4.76	.54	.48	.87
Boring/Interesting	4.26	.90	.66	.85
Relevant/Irrelevant*	4.70	.70	.44	.87
Exciting/Unexciting*	3.61	.92	.73	.85
Appealing/Unappealing*	3.92	.88	.73	.85
Fascinating/Mundane*	3.70	.96	.72	.85
Worthless/Valuable	4.64	.57	.56	.86
Involving/Uninvolving	3.82	.93	.69	.85
Not needed/Needed	4.74	.52	.52	.87

Scores based on semantic differential scale with 1 = important and 5 = unimportant. *Item was reverse coded. Valid N = 289.

Attitudes Toward Argument Quality

Attitudes toward argument quality were measured in this study using a researcher-developed index that was a combination of two scales. After reading the randomly assigned message, respondents indicated their attitude regarding issue-relevant arguments within the message on a series of 10 bipolar adjectives measured using a 5-point semantic differential scale. Seven items were adapted from a 10-item index that Lundy (2004) utilized to measure argument quality attributes and the remaining three items were drawn from Schmierbach's (2005) index of newsworthiness. The standard deviations for the scale ranged from .79 to 1.18 and the lowest corrected item-total correlation was .56 as shown in Table 4-8. The alpha reliability coefficient for the overall index was $\alpha = .92$ and could not be improved by deleting a single item. The grand mean for the argument quality index was 3.43 (SD = .79).

Table 4-8. Perceived Argument Quality Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Insignificant/Significant	3.29	1.18	.72	.90
Irrelevant/Relevant	3.54	1.10	.69	.91
Untimely/Timely	3.31	1.15	.60	.91
Not Believable/Believable	3.96	.95	.68	.91
Low Quality/High Quality	3.12	1.17	.76	.90
Not Convincing/Convincing	3.25	1.11	.77	.90
Not Credible/Credible	3.74	.97	.70	.91
Unreasonable/Reasonable	3.85	.91	.72	.91
Inconclusive/Conclusive	2.69	1.15	.70	.91
Inaccurate/Accurate	3.52	.79	.56	.91

Scores based on semantic differential scale with 1 = insignificant and 5 = significant. Valid N = 282.

Need for Cognition Scale

The Need for Cognition Scale consisted of 17 Likert-type questions where 1 was strongly disagree and 5 was strongly agree. The data for this scale demonstrated a satisfactory amount of variance with standard deviation ranging from .73 to 1.12. The discrimination index for the NFC scale (Table 4-9) showed the lowest corrected item-total correlation was .31. The reliability alpha coefficient for the overall NFC index was $\alpha = .86$ and would not have been improved with the removal of any single item. The grand mean for the overall index was 3.95 (SD = .51).

Table 4-9. Need for Cognition Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
NFC.1	3.55	.92	.41	.86
NFC.2*	4.46	.74	.58	.85
NFC.3*	4.27	.87	.46	.86

Table 4-9. Continued.

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
NFC.4 *	4.47	.73	.51	.86
NFC.5	3.40	1.12	.31	.86
NFC.6*	3.93	.98	.52	.85
NFC.7*	3.64	.99	.38	.86
NFC.8*	3.88	.94	.48	.86
NFC.9	4.08	.86	.59	.85
NFC.10	4.26	.81	.62	.85
NFC.11*	4.35	.74	.62	.85
NFC.12	3.44	.93	.46	.86
NFC.13	3.92	.92	.55	.85
NFC.14	3.93	.98	.54	.85
NFC.15*	3.74	1.00	.47	.86
NFC.16*	4.10	.92	.44	.86
NFC.17	3.70	.91	.37	.86

Scores based on Likert scale with 1 = strongly disagree and 5 = strongly agree. *Item was reverse coded. Valid N = 273.

Preexisting Attitudes Toward Agricultural Biotechnology

To measure preexisting attitudes toward agricultural biotechnology, respondents provided their response to six items on a 1 to 5 semantic differential scale. Standard deviations for items in this index ranged from .89 to .95. The lowest corrected item-total correlation (Table 4-10) for the items in this index was .85 indicating strong correlation between each item and the overall index score. The alpha reliability coefficient was $\alpha = .96$ justifying its use in the study. The grand mean for the overall scale was 3.96 (SD = .84).

Table 4-10. Preexisting Attitudes toward Agricultural Biotechnology Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Foolish/Wise	3.99	.90	.87	.96
Unacceptable/Acceptable	4.09	.89	.85	.96
Unfavorable/Favorable	3.93	.94	.90	.96
Wrong/Right	3.93	.89	.90	.96
Bad/Good	3.93	.90	.92	.95
Negative/Positive	3.86	.95	.88	.96

Scores based on semantic differential scale with 1 = foolish and 5 = wise. Valid N = 298.

Agricultural Biotechnology Belief Statements

In addition to the six-item scale to assess preexisting attitudes toward agricultural biotechnology, respondents provided their responses to a series of seven belief statements. These items were measured on a 5-point Likert scale with 1 being strongly disagree and 5 being strongly agree. Standard deviations for items in this scale ranged from .89 to 1.11. Table 4-11 shows the discrimination index with the lowest corrected item-total correlation at .58. The alpha reliability coefficient is $\alpha = .85$ indicating an acceptable level of reliability. The grand mean for the complete index was 3.30 (SD = .72).

Table 4-11. Agricultural Biotechnology Belief Statements Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Both large and small farmers reap economic benefits from agricultural biotechnology.	3.34	1.06	.60	.84
Agricultural biotechnology lacks adequate testing.*	2.95	1.04	.58	.84

Table 4-11. Continued

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Agricultural biotechnology is natural. The process is just faster and more precise than traditional plant breeding.	2.86	1.11	.60	.84
Biotech foods are in development that will improve human health.	3.71	.89	.63	.83
Agricultural biotechnology will help to feed the world's rapidly expanding population.	3.82	.96	.70	.82
Biotech crops improve water quality, requiring fewer chemicals than traditional crops.	3.44	.92	.62	.83
Biotech foods pose unforeseen health risks.*	2.95	.93	.60	.84

Scores based on Likert type scale with 1 = strongly disagree and 5 = strongly agree. *Item was reverse coded. Valid N = 301.

Attitudes Toward Message Topic

To measure attitudes toward the message topic of peanut allergen research, respondents provided their response to the same six items used to establish preexisting attitudes toward agricultural biotechnology. The six items were measured using a 1 to 5 semantic differential scale. Standard deviations for items in this attitude index ranged from .89 to .95. The discrimination index found the lowest corrected item-total correlation (Table 4-12) for the items in this index was .78. The alpha reliability coefficient was $\alpha = .95$ indicating its acceptability as an index in the current study. The grand mean for the overall scale was 4.36 (SD = .70).

Table 4-12. Attitudes toward Message Topic Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Foolish/Wise	4.29	.79	.81	.95
Unacceptable/Acceptable	4.53	.72	.78	.95
Unfavorable/Favorable	4.34	.81	.86	.94
Wrong/Right	4.32	.80	.86	.94
Bad/Good	4.34	.78	.91	.94
Negative/Positive	4.35	.77	.89	.94

Scores based on semantic differential scale with 1 = foolish and 5 = wise. Valid N = 299.

Likelihood to Publish

This scale included three items to measure how likely the respondent was to use the information contained in the message to write or publish a story. Standard deviations for the scale ranged from 1.36 to 1.41. The lowest corrected item-total correlation shown in the discrimination index (Table 4-13) was .75.

Table 4-13. Likelihood to Publish Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
How likely would you be to utilize the information in the press release to write or publish a story?	2.33	1.39	.85	.81
If you saw this story on the AP wire service, how likely would you be to publish the information?	2.51	1.36	.80	.85
How likely would you be to seek out a source to write or publish a story based on the information in the press release	2.59	1.41	.75	.90

Scores based on Likert type scale with 1 = highly unlikely and 5 = highly likely. Valid N = 239.

The alpha reliability coefficient for the likelihood to publish index was $\alpha = .90$, which is an acceptable level to use this index in the study. Although the alpha could be improved by removing one item, it is necessary to retain all three items in order to construct an index. The grand mean for the overall scale was 2.48 (SD = 1.26).

Manipulation Checks

To evaluate the message frame stimuli used as an independent variable, a series of manipulation checks were conducted. The three message frames (*scientific progress*, *health*, and *economics*) were developed using the same basic information regarding research of an allergen-free peanut. Each individual message was then enhanced with key words and phrases to exhibit the characteristics of the assigned frame. The messages were reviewed by a panel of experts then submitted to two rounds of message stimuli testing. During the second round of message testing, the mean attitudes toward argument quality score (based on the 10-item index utilized in the study) was used to compare the three frames. A one-way ANOVA found no significant difference between the attitudes toward argument quality of the three message frames ($F_{2,33} = .43$, $p = .66$) indicating that the respondents found them to be the same in argument quality regardless of the frame.

In the current study, respondents were randomly assigned to receive one of the three message frames. As a second manipulation check, respondents were then asked to select one of the frame categories (*scientific progress*, *health*, or *economics*) they thought was the most appropriate classification for the dominant theme or frame for the message. The *economics* and *health* frames seemed to be easily identifiable, but respondents who received the *scientific progress* frame classified it as either the intended frame (*scientific progress*) or the *health* frame (Table 4-14). This confusion between the *scientific progress* and *health* frames is a limitation of the study. Overall, 63% ($n = 194$) correctly identified their assigned message stimuli frame.

Table 4-14. Classification of Message Frame by Assigned Frame

Assigned Frame	N	Identified Frame			
		Health	Economics	Scientific Progress	Don't Know
Health	91	66	3	19	3
Economics	103	19	70	8	6
Scientific Progress	114	53	0	58	3
Total	308	138	73	85	12

A one-way ANOVA found a significant difference between the attitudes toward argument quality of the three message frames ($F_{2,281} = 7.46, p = .00$). In *post hoc* analysis, the Bonferroni procedure was used to explore this difference and found a significant difference in perceived argument quality between the *health* message frame and *economics* message frame ($p = .00$) and the *economics* and *scientific progress* frames ($p = .01$). However, no significant difference was found between the *health* and *scientific progress* message frames ($p = 1.00$). In the current study, argument quality was not intentionally manipulated *a priori* and was explored as a dependent variable and proxy for measuring newsworthiness.

To further evaluate the manipulation influence on the message frames, three additional univariate ANOVA tests were conducted (Table 4-15). Subjects were asked two questions to assess how important the message was to them personally and how motivated they were to read the message. To determine importance, subjects were asked “How important was the press release message to you personally?” on a 5-point Likert scale with 1 being not important at all and 5 being very important. A one-way ANOVA to compare the mean responses for subjects receiving the different message frames was not significant ($F_{2,305} = .84, p = .43$).

To determine motivation, subjects were asked “How motivated were you to read the press release?” on a 5-point Likert scale. Comparison of the mean response for each message frame

using a one-way ANOVA found there was a significant difference ($F_{2,306} = 5.10, p = .01$).

Subjects who received the *health* message frame indicated more personal motivation ($M = 3.06, SD = .95$) than those who received the *economics* ($M = 2.72, SD = 1.11$) or *scientific progress* ($M = 3.13, SD = .93$) message frames.

Subjects were also asked to assess the newsworthiness of the press release message using a 5-point Likert scale where 1 was strongly disagree and 5 was strongly agree. Responses to the statement: “I believe this press release is newsworthy” were significantly different between the three message frames ($F_{2,306} = 11.54, p = .00$). The mean response for *health* ($M = 3.53, SD = .98$) and *scientific progress* ($M = 3.49, SD = 1.13$) indicated these message frames were more newsworthy than the *economics* frame ($M = 2.87, SD = 1.14$).

Table 4-15. ANOVA for Subjects’ Perceptions of Message Frames

	Health			Economics			Scientific Progress		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Importance	90	2.34	1.11	102	2.18	1.01	114	2.34	1.10
Motivation	90	3.06	.95	103	2.72	1.11	114	3.13	.93
Newsworthiness	91	3.53	.98	103	2.87	1.14	113	3.49	1.13
	F	p value							
Importance	.84	.43							
Motivation	5.10	.01							
Newsworthiness	11.54	.00							

Additional Bonferroni comparisons were conducted to extend the manipulation check of the message frames. The comparison showed no significant difference in “motivation” or “importance” between the three frames, but did show a significant difference in “newsworthiness” between the *health* and *economics* message frames ($p = .00$) and *economics* and *scientific progress* message frames ($p = .00$). The comparison did not show a significant

difference between the *health* and *scientific progress* message frames in regard to “newsworthiness.”

Tests of Hypotheses

Hypothesis testing focused on three independent variables (message frame, issue involvement, preexisting attitudes toward agricultural biotechnology) and two dependent variables (attitudes toward argument quality and likelihood to publish).

H1: Attitudes toward argument quality of a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.

To address H1, a three-way factorial ANOVA was conducted to examine the interaction of the independent variables on attitudes toward argument quality. As illustrated in Table 4-16, the interaction of message frame, issue involvement, and preexisting attitudes toward agricultural biotechnology was not significant ($F_{2,253} = 2.76$, $p = .07$) on attitudes toward argument quality. However, the three-way factorial ANOVA did indicate main effects for message frame ($F_{1,253} = 5.65$, $p = .00$), issue involvement ($F_{1,253} = 3.88$, $p = .05$), and preexisting attitudes toward agricultural biotechnology ($F_{1,253} = 22.42$, $p = .00$).

Table 4-16. ANOVA for Message Frame, Issue Involvement, and Attitudes toward Agricultural Biotechnology on Perceived Argument Quality

Source	df	F	p value
Message Frame	2	5.65	.00
Issue Involvement	1	3.88	.05
Preexisting Attitudes	1	22.42	.00
Message Frame * Issue Involvement * Preexisting Attitudes	2	2.76	.07

Post hoc analysis using the Bonferroni procedure examined the significant difference in message frame and found a significant difference between the *health* and *economics* message frames ($p = .00$) and *economics* and *scientific progress* message frames ($p = .02$). The

comparison did not show a significant difference between the *health* and *scientific progress* message frames ($p = 1.00$). An overall means table provides a summary of attitudes toward argument quality, split by high/low issue involvement, more positive/less positive preexisting attitudes toward agricultural biotechnology, and the assigned message frame (Table 4-17).

Table 4-17. Means for Attitudes Toward Argument Quality Split by High/Low Issue Involvement, More Positive/ Less Positive Attitudes Toward Agricultural Biotechnology, and Message Frame

Message Frame	High Issue Involvement		Low Issue Involvement	
	More Positive Attitudes	Less Positive Attitudes	More Positive Attitudes	Less Positive Attitudes
Health	3.97 (26)	3.15 (13)	3.74 (23)	3.14 (19)
Economics	3.46 (27)	3.03 (15)	3.23 (27)	2.93 (20)
Scientific Progress	3.57 (39)	3.69 (14)	3.67 (22)	3.03 (20)
Total	3.65 (92)	3.28 (42)	3.53 (72)	3.03 (59)

Note: Frequencies are in parentheses.

H2: Attitudes toward likelihood to publish information presented in a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.

To address H2, a three-way factorial ANOVA was conducted to examine the interaction of the independent variables on attitudes toward likelihood to publish. The three-way factorial ANOVA for likelihood to publish found no significant interaction or main effects (Table 4-18); therefore, H2 is not supported. Table 4-19 provides the means table for likelihood to publish split by the two levels for issue involvement and preexisting attitudes toward agricultural biotechnology and the three message frames.

Table 4-18. ANOVA for Message Frame, Issue Involvement, and Attitudes Toward Agricultural Biotechnology on Likelihood to Publish

Source	df	F	p value
Message Frame	2	2.40	.09
Issue Involvement	1	.80	.37
Preexisting Attitudes	1	2.76	.10
Message Frame * Issue Involvement * Preexisting Attitudes	2	.049	.95

Table 4-19. Means for Likelihood to Publish Split by High/Low Issue Involvement, More Positive/ Less Positive Attitudes Toward Agricultural Biotechnology, and Message Frame

Message Frame	High Issue Involvement		Low Issue Involvement	
	More Positive Attitudes	Less Positive Attitudes	More Positive Attitudes	Less Positive Attitudes
Health	2.76 (25)	2.14 (12)	2.95 (20)	2.52 (17)
Economics	2.63 (23)	2.18 (15)	1.97 (22)	1.83 (14)
Scientific Progress	2.70 (37)	2.60 (10)	2.41 (18)	2.36 (12)
Total	2.70 (85)	2.28 (37)	2.43 (60)	2.26 (43)

Note: Frequencies are in parentheses.

H3: Subjects who are high in issue involvement and are presented with the *scientific progress* frame will have more favorable attitudes toward argument quality than those who are low in issue involvement and receive either the *economics* or *health* frames.

It was hypothesized that subjects who were presented with the *scientific progress* frame who were high in issue involvement (n = 53) would have more favorable attitudes toward argument quality than those who were low in issue involvement and received either the *economics* (n = 47) or *health* (n = 42) message frames. A two-way factorial ANOVA partially supported this hypothesis (Table 4-20). The interaction of message frame and issue involvement

was not significant ($F_{2,262} = .01$, p value = .99), but the main effects were significant for message frame ($F_{1,262} = 5.50$, p value = .01) and issue involvement ($F_{1,262} = 4.70$, p value = .03). Although the interaction of message frame and issue involvement was not significant, visual inspection of the means table indicated that the mean for attitudes toward argument quality was highest for subjects exposed to the *health* frame with high issue involvement ($M = 3.69$, $SD = .84$), followed by the hypothesized group – subjects exposed to the *scientific progress* frame with high issue involvement ($M = 3.56$, $SD = .83$).

Table 4-20. ANOVA for Message Frame and Issue Involvement on Perceived Argument Quality

Source	df	F	p value
Message Frame	2	5.50	.01
Issue Involvement	1	4.70	.03
Message Frame * Issue Involvement	2	.01	.99

H4: Subjects who have more positive attitudes toward agricultural biotechnology and are presented with the *scientific progress* frame will have more favorable attitudes toward argument quality than those who have less positive attitudes toward agricultural biotechnology and receive either the *economics* or *health* frames.

It was expected that subjects exposed to the *scientific progress* frame who had more positive preexisting attitudes toward agricultural biotechnology ($n = 61$) would have more favorable attitudes toward argument quality than those with less positive attitudes and presented with the *economics* ($n = 35$) or *health* ($n = 32$) message frames. A two-way factorial ANOVA (Table 4-21) provides partial support for this hypothesis. The interaction between message frame and attitudes toward agricultural biotechnology was not significant ($F_{2,271} = 2.04$, p value = .13). However, the ANOVA did indicate significant main effects for message frame ($F_{1,271} = 6.59$, p value = .00) and attitudes toward agricultural biotechnology ($F_{1,271} = 28.52$, p value = .00).

Table 4-21. ANOVA for Message Frame and Attitudes Toward Agricultural Biotechnology on Perceived Argument Quality

Source	df	F	p value
Message Frame	2	6.59	.00
Preexisting Attitudes	1	28.52	.00
Message Frame * Preexisting Attitudes	2	2.04	.13

Post hoc analysis using the Bonferroni procedure examined the significant difference in message frame and found a significant difference between the *health* and *economics* message frames ($p = .00$) and *economics* and *scientific progress* message frames ($p = .01$), but did not find a significant difference between the *health* and *scientific progress* message frames ($p = 1.00$). Visual inspection of the means table indicated that the mean for attitudes toward argument quality was highest for subjects exposed to the *health* frame with more positive preexisting attitudes ($M = 3.89$, $SD = .70$), followed by the hypothesized group – subjects exposed to the *scientific progress* frame with more positive preexisting attitudes ($M = 3.63$, $SD = .81$).

H5: For those who receive the *scientific progress* frame, subjects who are high in issue involvement will have more favorable attitudes toward argument quality than subjects who are low in issue involvement.

It was expected that for subjects who were presented with the *scientific progress* frame, those who were high in issue involvement ($n = 53$) would have more favorable attitudes toward argument quality than those low in issue involvement ($n = 42$). An independent samples t-test (Table 4-22) found no significant difference between the two groups ($t = -1.23$, $p \text{ value} = .22$), providing no support for this hypothesis. The mean attitudes toward argument quality score for those low in issue involvement was 3.37 ($SD = .69$) compared to the mean score of 3.56 ($SD = .83$) for those high in issue involvement.

Table 4-22. Independent Samples T-test for Significant Differences Between High/Low Issue Involvement on Perceived Argument Quality for Subjects Who Received *Scientific Progress* Message Frame

	N	Mean	SD	t	df	p value
Low Issue Involvement	42	3.37	.69	-1.23	95	.22
High Issue Involvement	55	3.56	.83			

H6: For those who receive the *health* frame, subjects who are low in issue involvement will have more favorable attitudes toward argument quality than subjects who are high in issue involvement.

It was hypothesized that for subjects who were presented with the *health* frame, those who were low in issue involvement ($n = 42$) would have more favorable attitudes toward argument quality than those high in issue involvement ($n = 39$). An independent samples t-test (Table 4-23) found no significant difference between the two groups and indicated no support for this hypothesis. In fact, the mean for those high in issue involvement ($M = 3.70$, $SD = .84$) was greater than those low in issue involvement ($M = 3.47$, $SD = .70$).

Table 4-23. Independent Samples T-test for Significant Differences Between High/Low Issue Involvement on Perceived Argument Quality for Subjects Who Received *Health* Message Frame

	N	Mean	SD	t	df	p value
Low Issue Involvement	42	3.47	.70	-1.29	79	.20
High Issue Involvement	39	3.70	.84			

H7: A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the *scientific progress* frame will explain the greatest variance in attitudes toward argument quality.

To test H7, multiple linear regression was conducted with issue involvement, preexisting attitudes toward agricultural biotechnology, message frame serving as predictors of attitudes toward argument quality. Table 4-24 displays the results of this analysis and provides support for the hypothesis. The model is significant ($F_{3,264} = 15.46$, $p \text{ value} = .00$) and explained 14.1% (adjusted R^2) of the variance in perceived argument quality. Of the significant predictors, the

beta weights for preexisting attitudes ($\beta = .33$) and issue involvement ($\beta = .18$) indicate a positive relationship between each of these variables and attitudes toward argument quality.

Table 4-24. Multiple Linear Regression Analysis for Variables Predicting Perceived Argument Quality

Explanatory Variable	Argument Quality				Adjusted R ²
	B	SE B	β	p value	.141
Message Frame	-.04	.06	-.04	.45	
Preexisting Attitudes	.31	.05	.33	.00	
Issue Involvement	.27	.08	.18	.00	

H8: A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the *scientific progress* frame will explain the greatest variance in likelihood to publish the information.

Similar to the previous hypothesis, H8 expects that the combination of three independent variables will explain the greatest variance in likelihood to publish. Table 4-25 displays the results of this analysis and provides support for the hypothesis. The model is significant ($F_{3,224} = 3.57$, p value = .02), but only explains 3.3% (adjusted R²) of the variance in likelihood to publish. Preexisting attitudes was a significant predictor of attitudes toward argument quality and the positive beta weight ($\beta = .18$) indicates a positive relationship.

Table 4-25. Multiple Linear Regression Analysis for Variables Predicting Likelihood to Publish.

Explanatory Variable	Argument Quality				Adjusted R ²
	B	SE B	β	p value	.033
Message Frame	-.07	.10	-.04	.50	
Preexisting Attitudes	.28	.10	.18	.01	
Issue Involvement	.23	.15	.10	.12	

Post Hoc Analyses

The data collected in this study allowed for additional data analysis using independent samples t-tests, ANOVA, and regression. These analyses provided additional insight into the data and possible implications beyond those hypothesized *a priori*.

Message Frame Identification

In reference to the lack of clarity between the *scientific progress* and *health* message frames, a three-way AVOVA was conducted using the message frames as subjects identified them instead of the randomly assigned message condition. The independent variables of issue involvement and preexisting attitudes toward agricultural biotechnology were also included to explore the interaction of subject-identified message frames on attitudes toward argument quality. Subjects had four options to identify the frame: *health*, *economics*, *scientific progress*, or unknown. Table 4-26 displays the results of this ANOVA which found a significant three-way interaction between the message frame identified by subjects, issue involvement, and attitudes toward agricultural biotechnology ($F_{3,264} = 3.24$, p value = .01) on attitudes toward argument quality. The main effects of message frame ($F_{3,264} = 8.57$, p value = .00) and attitudes toward agricultural biotechnology ($F_{1,264} = 11.20$, p value = .00) were also significant, but the issue involvement main effect was not significant ($F_{1,264} = 2.55$, p value = .11).

Table 4-26. ANOVA for Subject-Identified Message Frame, Issue Involvement, and Preexisting Attitudes Toward Agricultural Biotechnology on Perceived Argument Quality

Source	df	F	p value
Subject-Identified Message Frame	3	8.57	.00
Preexisting Attitudes	1	11.20	.00
Issue Involvement	1	2.55	.11
Message Frame * Issue Involvement * Attitudes	3	3.24	.01

Attitudes and Message Frame

As outlined in hypotheses 5 and 6, the influence of high or low issue involvement did not demonstrate a significant difference in attitudes toward message quality for the *health* and *scientific progress* frames. However, preexisting attitudes toward agricultural biotechnology did have an influence on message quality between those who were more positive or less positive in their attitudes for two of the three messages (Table 4-27). Independent samples t-tests showed that for subjects who received the *health* message frame, there was a significant difference between those who were more positive or less positive in their preexisting attitudes toward agricultural biotechnology ($t = -4.96$, $p \text{ value} = .00$). This significant difference was also found for those who received the *economics* frame ($t = -2.46$, $p \text{ value} = .02$), but there was not a significant difference between the two groups for those who received the *scientific progress* message ($t = -1.98$, $p \text{ value} = .05$).

Table 4-27. Independent Samples T-test for Significant Differences Between More Positive/Less Positive Attitudes Toward Agricultural Biotechnology on Perceived Argument Quality Spilt by Message Frame

Message Frame		N	Mean	SD	t	df	p value
Health	Less Positive	33	3.14	.65	-4.96	85	.00
	More Positive	54	3.89	.70			
Economics	Less Positive	37	2.94	.75	-2.46	90	.02
	More Positive	55	3.35	.78			
Scientific Progress	Less Positive	35	3.32	.69	-1.98	96	.05
	More Positive	63	3.63	.83			

In addition to preexisting attitudes toward agricultural biotechnology, subjects also provided their attitudes toward the message topic of peanut allergen research. An independent samples t-test (Table 4-28) to compare less positive and more positive subjects in terms of

preexisting attitudes found a significant difference on attitudes toward the message topic ($p = .00$).

Table 4-28. Independent Samples T-Test for Significant Differences Between Preexisting Attitudes Toward Agricultural Biotechnology Groups and Attitudes Toward Message Topic

	N	Mean	SD	t	df	p value
Less Positive	112	3.98	.75	-8.29	292	.00
More Positive	182	4.60	.53			

Need for Cognition

Need for cognition scores were collected in the instrument, but were not included in the hypothesis tests. Subjects were split into high and low need for cognition based on a mean split ($M = 3.95$, $SD = .51$) resulting in 146 (47.4%) low need for cognition subjects and 127 (41.2%) high need for cognition subjects. Independent samples t-test to compare low and high need for cognition subjects found no significant difference on attitudes toward argument quality ($p = .15$). *Post hoc* analysis using multiple linear regression included need for cognition score with the independent variables of issue involvement, preexisting attitudes toward agricultural biotechnology, and message frame to predict perceived argument quality score. This regression model (Table 4-29) was significant ($F_{4,245} = 11.59$, $p \text{ value} = .00$) and explained 14.7% of the variance in the perceived argument quality score.

Table 4-29. Multiple Linear Regression Analysis for Variables Predicting Perceived Argument Quality, Including Need for Cognition

Explanatory Variable	Argument Quality				Adjusted R ²
	B	SE B	β	p value	.147
Message Frame	-.04	.06	-.04	.49	
Attitudes	.28	.06	.30	.00	
Issue Involvement	.26	.09	.17	.00	
Need for Cognition	-.25	.09	-.16	.01	

Need for cognition was also included in a 4-way factorial ANOVA to examine the interaction of message frame, issue involvement, preexisting attitudes toward agricultural biotechnology, and need for cognition on attitudes toward argument quality. As Table 4-30 shows, the 4-way interaction was not significant ($F_{2,246} = 1.75, p = .18$), but the ANOVA did find significant main effects for the message frame ($F_{2,246} = 6.57, p = .00$) and preexisting attitudes toward agricultural biotechnology ($F_{1,246} = 3.09, p = .08$). A Bonferroni procedure to explore the significant difference between message frames indicated a significant difference between the *health* and *economics* frames ($p = .00$) and *scientific progress* and *economics* frames ($p = .01$), but the *health* and *scientific progress* frames were not significantly different ($p = 1.00$).

Table 4-30. ANOVA for Message Frame, Issue Involvement, Preexisting Attitudes Toward Agricultural Biotechnology, and Need for Cognition on Perceived Argument Quality

Source	df	F	p value
Message Frame	2	6.57	.00
Preexisting Attitudes	1	24.49	.00
Issue Involvement	1	3.09	.08
Need for Cognition	1	.32	.57
Message Frame * Issue Involvement * Attitudes * Need for Cognition	2	1.75	.18

Differences Between Organization Membership

Post hoc analyses were conducted to explore what differences existed between members of AAEA and NASW. As mentioned previously, 75 respondents were members of AAEA (24.4%) and 215 (69.8%) were members of NASW, while the remaining 18 (5.8%) respondents said they were not members of either organization. Means for average issue involvement score were compared using an independent samples t-test to determine if there were any differences according to organization membership. Table 4-31 demonstrates there were significant differences in means for issue involvement based on membership in AAEA or NASW.

Respondents who were members of AAEA had higher average issue involvement scores than members of NASW. This was originally hypothesized because the issue involvement question dealt with reporting on food and natural resource issues, which best describes the topics members of AAEA would report on most often. Although the mean issue involvement scores are statistically significantly different for the two groups, the mean scores for AAEA ($M = 4.39$) and NASW ($M = 4.20$) are on the higher end of the scale indicating an overall interest in food and natural resource topics for both groups. This result demonstrates agricultural topics have the potential to be covered by different types of reporters, but issue involvement does vary and may be an influence when persuading communicators as to the newsworthiness of agricultural issues.

Table 4-31. Independent Samples T-test for Significant Differences Between Organization Membership and Issue Involvement

	N	Mean	SD	t	df	p value
AAEA	73	4.39	.51	2.54	275	.01
NASW	204	4.20	.56			

Note: AAEA = American Agricultural Editors' Association and NASW = National Association of Science Writers.

Preexisting attitudes toward agricultural biotechnology between members of the professional communication organizations were also significantly different as shown in Table 4-32. AAEA members indicated more positive attitudes toward agricultural biotechnology ($M = 4.39$, $SD = .71$) than NASW members ($M = 3.80$, $SD = .82$). Again, both means were above the midpoint on the 1 to 5 scale indicating more positive preexisting attitudes toward agricultural biotechnology overall.

Table 4-32. Independent Samples T-test for Significant Differences Between Organization Membership and Preexisting Attitudes toward Agricultural Biotechnology

	N	Mean	SD	t	df	p value
AAEA	74	4.39	.71	5.472	282	.00
NASW	210	3.80	.82			

Note: AAEA = American Agricultural Editors' Association and NASW = National Association of Science Writers.

Further data analysis examined what frames were randomly assigned to members of each organization. Table 4-33 shows the proportion of subjects who received each message frame divided by their membership organization. Comparison of the percentage of subjects for each frame indicated similar distribution across frames and between groups.

Table 4-33. Percentage of Assigned Frame Split within Membership Organization

Membership Organization	Assigned Frame		
	Health	Economics	Scientific Progress
AAEA	25.3 (19)	37.3 (28)	37.3 (28)
NASW	30.7 (66)	33.0 (71)	36.3 (78)
Total	29.3 (85)	34.1 (99)	36.6 (106)

Note: Frequencies are in parentheses. Missing N=18.

This data was further explored to discover whether or not members of the two organizations were able to identify the frame to which they were assigned. Table 4-34 shows the proportion of subjects who identified each frame divided by the membership organization. For AAEA members, 68.4% (n = 13) correctly identified the *health* frame, 50% (n = 14) correctly identified the *economics* frame, and 57.1% (n = 16) correctly identified the *scientific progress* frame. For NASW members, 75.8% (n = 50) correctly identified the *health* frame, 73.2% (n = 52) correctly identified the *economics* frame, and 53.8% (n = 42) correctly identified the

scientific progress frame. Overall, NASW members were better able to correctly classify their assigned frame. It appeared that AAEA members who received the *economics* frame were confused on how to classify it. Only half of the subjects correctly identified the frame, while the remaining half were divided between *health* (32.1%, n = 9) and *scientific progress* (14.3%, n = 4) frames. The *scientific progress* frame was also difficult for members of both organizations to classify. For those who received *scientific progress* as their assigned message frame, 42.9% (n = 12) of AAEA members and 43.6% (n = 34) of NASW members classified it as the *health* frame. This confusion may be attributed to the fact that the topic of peanut allergen research can be viewed as a health concern and subjects chose the *health* frame accordingly.

Table 4-34. Classification of Message Frame within Membership Organization

	Assigned Frame	Percent of Identified Frame			
		Health	Economics	Scientific Progress	Don't Know
AAEA	Health	68.4 (13)	.0 (0)	26.3 (5)	5.3 (1)
	Economics	32.1 (9)	50.0 (14)	14.3 (4)	3.6 (1)
	Scientific Progress	42.9 (12)	.0 (0)	57.1 (16)	.0 (0)
NASW	Health	75.8 (50)	3.0 (2)	18.2 (12)	3.0 (2)
	Economics	14.1 (10)	73.2 (52)	5.6 (4)	7.0 (5)
	Scientific Progress	43.6 (34)	.0 (0)	53.8 (42)	2.6 (2)

Note: Frequencies are in parentheses. Missing N=18.

Beyond the independent variables, the two membership groups were also compared on the dependent variables of attitudes toward argument quality and likelihood to publish. Table 4-35

displays the results of an independent samples t-test that indicated a significant difference between the groups in their attitudes toward argument quality. AAEA members were more favorable in their attitudes toward the argument quality of the messages ($M = 3.85$, $SD = .73$) than NASW members ($M = 3.25$, $SD = .73$).

Table 4-35. Independent Samples T-test for Significant Differences Between Organization Membership and Attitudes Toward Argument Quality

	N	Mean	SD	t	df	p value
AAEA	72	3.85	.73	5.72	266	.00
NASW	196	3.25	.76			

Note: AAEA = American Agricultural Editors' Association and NASW = National Association of Science Writers.

Upon further examination, a significant difference was found between each group's mean scores for attitudes toward argument quality for each frame (Table 4-36). AAEA members indicated significantly more favorable attitudes toward argument quality for each of the message frames than NASW members. For both groups, the *health* frame received the most favorable attitudes toward argument quality with the AAEA mean score of 4.15 ($SD = .63$) and the NASW mean score of 3.41 ($SD = .75$).

Table 4-36. Independent Samples T-tests for Significant Differences Between Organization Membership and Attitudes Toward Argument Quality of Message Frames

Message Frame	AAEA			NASW			t	df	p value
	N	Mean	SD	N	Mean	SD			
Health	18	4.15	.63	63	3.41	.75	3.83	79	.00
Economics	26	3.55	.83	65	3.03	.73	2.97	89	.00
Scientific Progress	28	3.93	.61	68	3.33	.77	3.72	94	.00

Finally, the two membership groups' scores on the likelihood to publish index were compared. An independent samples t-test found a significant difference between the groups on

this dependent variable (Table 4-37) with AAEA members providing a more favorable mean score ($M = 3.11$, $SD = 1.30$) than NASW members ($M = 2.23$, $SD = 1.16$).

Table 4-37. Independent Samples T-test for Significant Differences Between Organization Membership and Likelihood to Publish

	N	Mean	SD	t	df	p value
AAEA	62	3.11	1.30	4.89	224	.00
NASW	164	2.23	1.16			

Note: AAEA = American Agricultural Editors' Association and NASW = National Association of Science Writers.

Table 4-38 shows the mean likelihood to publish score for each message frame split by membership group. Again, there is a significant difference between the two groups' scores for likelihood to publish for each message frame with *health* receiving the most favorable mean score for both AAEA members ($M = 3.26$, $SD = 1.40$) and NASW members ($M = 2.42$, $SD = 1.21$). It is also interesting to note that AAEA members' lowest mean score was for the *economics* frame ($M = 2.75$, $SD = 1.34$), which was still greater than any mean score provided by NASW members regardless of the message frame.

Table 4-38. Independent Samples T-tests for Significant Differences Between Organization Membership and Likelihood to Publish for Each Message Frame

Message Frame	AAEA			NASW			t	df	p value
	N	Mean	SD	N	Mean	SD			
Health	18	3.26	1.40	53	2.42	1.21	2.43	69	.02
Economics	21	2.75	1.34	56	2.01	1.02	2.60	75	.01
Scientific Progress	23	3.32	1.15	55	2.28	1.22	3.47	75	.00

Index Development

Additional *post hoc* analysis further explored the construction of the issue involvement and attitudes toward argument quality indexes. The issue involvement scale was based on nine items,

which had an alpha reliability coefficient of $\alpha = .87$. Through factor analysis, principal component analysis found that the items loaded to form two components (Table 4-39).

Table 4-39. Factor Loadings for Items Measuring Issue Involvement

Items	Component 1	Component 2
Important/Unimportant*	.59	.38
Boring/Interesting	.75	-.05
Relevant/Irrelevant*	.55	.415
Exciting/Unexciting*	.79	-.38
Appealing/Unappealing*	.79	-.32
Fascinating/Mundane*	.79	-.36
Worthless/Valuable	.67	.46
Involving/Uninvolving	.77	-.32
Not needed/Needed	.64	.58
Eigenvalue	4.52	1.33
Percent of Variance Explained	50.18	14.80
Cronbach's Alpha	.87	

Extraction Method: Principal Component Analysis. *Item was reverse coded.

Zaichkowsky (1994) also found two subscales during the development of the 10-item Personal Involvement Inventory for Advertising (PIIA) that was used to measure issue involvement in the current study. The items of *interesting*, *appealing*, *fascinating*, *exciting*, and *involving* were found to be based more on emotions and could be loaded to form an “affective” issue involvement scale. The items of *important*, *relevant*, *valuable*, *means a lot to me*, and *needed* appeared to be more rational in nature and could be loaded together to form a “cognitive” issue involvement scale (Zaichkowsky, 1994). During the pilot testing process, the *means a lot to me* item was removed to improve alpha reliability. Follow-up principal component analysis used these individual items to form the cognitive and affective issue involvement scales, which then loaded as unidimensional constructs.

The cognitive issue involvement index (Table 4-40) had an alpha reliability coefficient of $\alpha = .74$ and explained 57.31% of the items' variance. The scale had a range of standard deviations from .51 to .72. The discrimination index for the cognitive issue involvement scale (Table 4-41) showed the corrected item-total correlation ranged from .47 to .63. The grand mean for the cognitive issue involvement scale was 3.55 (SD = .34).

Table 4-40. Factor Loadings for Items Measuring Cognitive Issue Involvement

Items	Component 1
Important/Unimportant*	.70
Relevant/Irrelevant*	.70
Worthless/Valuable	.79
Not needed/Needed	.839
Eigenvalue	2.29
Percent of Variance Explained	57.31
Cronbach's Alpha	.74

Extraction Method: Principal Component Analysis. *Item was reverse coded.

Table 4-41. Cognitive Issue Involvement Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item-Total Correlation	Alpha if Item Deleted
Important/Unimportant*	4.76	.53	.47	.71
Relevant/Irrelevant*	4.69	.72	.49	.72
Worthless/Valuable	4.62	.60	.58	.65
Not needed/Needed	4.75	.51	.63	.63

Scores based on semantic differential scale with 1 = important and 5 = unimportant. *Item was reverse coded. Valid N=296.

The affective issue involvement index (Table 4-42) had an alpha reliability coefficient of $\alpha = .89$ and explained 69.18% of the items' variance. Standard deviations for this index ranged from .88 to .96, and the discrimination index (Table 4-43) showed the corrected item-total

correlation ranged from .62 to .77. The grand mean for the affective issue involvement scale was 3.21 (SD = .64).

Table 4-42. Factor Loadings for Items Measuring Affective Issue Involvement

Items	Component 1
Boring/Interesting	.74
Exciting/Unexciting*	.87
Appealing/Unappealing*	.85
Fascinating/Mundane*	.86
Involving/Uninvolving	.83
Eigenvalue	3.46
Percent of Variance Explained	69.18
Cronbach's Alpha	.89

Extraction Method: Principal Component Analysis. *Item was reverse coded.

Table 4-43. Affective Issue Involvement Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Boring/Interesting	4.27	.90	.62	.89
Exciting/Unexciting*	3.62	.92	.74	.85
Appealing/Unappealing*	3.92	.88	.75	.86
Fascinating/Mundane*	3.71	.96	.77	.85
Involving/Uninvolving	3.83	.93	.72	.86

Scores based on semantic differential scale with 1 = boring and 5 = interesting. *Item was reverse coded. Valid N = 293.

Factor analysis was also utilized to further investigate the attitudes toward argument quality index during *post hoc* analysis. The index used in the current study was developed using seven items adapted from a 10-item index that Lundy (2004) utilized to measure argument quality attributes and the three items drawn from Schmierbach's (2005) index of newsworthiness. In the current study, the 10-item index had an alpha reliability coefficient of $\alpha =$

.92. Principal component analysis found these used individual items loaded as two distinct constructs (Table 4-44).

Table 4-44. Factor Loadings for Items Measuring Perceived Argument Quality

Items	Component 1	Component 2
Insignificant/Significant	.76	.49
Irrelevant/Relevant	.74	.47
Untimely/Timely	.66	.50
Not Believable/Believable	.76	-.33
Low Quality/High Quality	.81	.08
Not Convincing/Convincing	.83	-.20
Not Credible/Credible	.78	-.45
Unreasonable/Reasonable	.79	-.31
Inconclusive/Conclusive	.76	.16
Inaccurate/Accurate	.64	-.35
Eigenvalue	5.72	1.31
Percent of Variance Explained	57.18	13.11
Cronbach's Alpha	.92	

Extraction Method: Principal Component Analysis.

The two subscales that were included to develop the attitudes toward argument quality index were then divided back into the 3-item and 7-item scales. These subscales then loaded as unidimensional constructs. The 3-item newsworthiness index of *significant*, *relevant*, and *timely* (Table 4-45) had an alpha reliability coefficient of $\alpha = .87$ and explained 79.23% of the items' variance. This index had standard deviations ranging from 1.09 to 1.17. The discrimination index (Table 4-46) showed the corrected item-total correlation ranged from .66 to .80. The grand mean for the affective issue involvement scale was 3.01 (SD = .90).

Table 4-45. Factor Loadings for Items Measuring Newsworthiness Index

Items	Component 1
Insignificant/Significant	.92
Irrelevant/Relevant	.92
Untimely/Timely	.83
Eigenvalue	2.38
Percent of Variance Explained	79.23
Cronbach's Alpha	.87

Extraction Method: Principal Component Analysis.

Table 4-46. Newsworthiness Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Insignificant/Significant	3.28	1.17	.79	.77
Irrelevant/Relevant	3.53	1.09	.80	.77
Untimely/Timely	3.33	1.15	.66	.89

Scores based on semantic differential scale with 1 = insignificant and 5 = significant. Valid N = 300.

The 7-item argument quality subscale (Table 4-47) had an alpha reliability coefficient of $\alpha = .90$ and explained 63.71% of the items' variance. Standard deviations for this index ranged from .80 to 1.17, and the discrimination index (Table 4-48) showed the corrected item-total correlation ranged from .64 to .82. The grand mean for the affective issue involvement scale was 2.76 (SD = .65).

Table 4-47. Factor Loadings for Items Measuring Seven-Item Argument Quality Index

Items	Component 1
Not Believable/Believable	.80
Low Quality/High Quality	.79
Not Convincing/Convincing	.87
Not Credible/Credible	.86
Unreasonable/Reasonable	.83

Table 4-47. Continued

Items	Component 1
Inconclusive/Conclusive	.72
Inaccurate/Accurate	.69
Eigenvalue	4.46
Percent of Variance Explained	63.71
Cronbach's Alpha	.90

Extraction Method: Principal Component Analysis.

Table 4-48. Seven-Item Argument Quality Scale Inter-item Consistency Statistics

	Mean	SD	Corrected Item- Total Correlation	Alpha if Item Deleted
Not Believable/Believable	3.96	.95	.71	.89
Low Quality/High Quality	3.13	1.17	.72	.89
Not Convincing/Convincing	3.25	1.11	.82	.87
Not Credible/Credible	3.74	.97	.78	.88
Unreasonable/Reasonable	3.86	.91	.75	.88
Inconclusive/Conclusive	2.69	1.15	.64	.90
Inaccurate/Accurate	3.52	.80	.59	.90

Scores based on semantic differential scale with 1 = not believable and 5 = believable.

Valid N = 284.

CHAPTER 5 DISCUSSION

Overview

Research suggests that the American public has a limited understanding of science and specifically its application in agricultural pursuits. The media are the public's primary source of current information regarding science information, but provide limited coverage of agricultural topics. Those within the agricultural industry charged with communicating about new and possibly controversial agricultural issues such as agricultural biotechnology can utilize message frames to influence public opinion through media coverage. Traditionally, agricultural issues are framed as positive versus negative or risk versus benefit. However, little empirical research has been conducted to examine how the use of positively valenced message frames could affect communicators' opinions toward the message and likelihood to publish the information.

This study utilized the ELM framework to examine preexisting attitudes toward agricultural biotechnology, issue involvement, and message frames on attitudes toward argument quality and likelihood to publish information within the message. Three positively valenced message frames (*health, economics, and scientific progress*) were constructed to communicate the development of an allergen-free peanut through the use of agricultural biotechnology. Accessible samples of AAEEA and NASW members were randomly assigned to receive one of the messages, which featured a distinct message frame.

Chapter 4 provided data analyses and results, which are based on 308 subjects for an overall response rate of 24.8%. Seventy-five (24.4%) were AAEEA members and 215 (69.8%) were NASW members. The remaining 18 subjects (5.8%) did not identify themselves as members of either organization. Subjects were 53.2% (n = 164) female and 41.6% (n = 128) male with a mean age of 49.9 years old. Subjects had either a graduate or professional degree

(57.5%, n = 177) or at least a four-year bachelor's degree (37.7%, n = 116). Most subjects identified themselves as freelance writers (58.4%, n = 180). This chapter presents the key findings, implications, limitations, recommendations for theory and practice, and conclusions.

Key Findings

Descriptive analysis of the data found a mean issue involvement score, to reporting on food and natural resource topics, of 4.24 (where 5.0 is the upper limit) to the issue of reporting food and natural resource topics indicating that, overall, subjects were highly involved with the research area. As anticipated, members of AAFA and NASW did have significantly different issue involvement scores, but the mean for both groups was on the upper end of the scale (AAFA M = 4.39, NASW M = 4.20). Subjects also had more positive preexisting attitudes toward agricultural biotechnology overall with a mean score of 3.96 on a 1-5 scale.

A total of eight major hypotheses were tested in this study. Hypothesis 1 stated: *Attitudes toward argument quality of a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.* Hypothesis 1 was partially supported. Findings indicated that the three-way interaction of message frame, issue involvement, and preexisting attitudes toward agricultural biotechnology was not significant. However, the main effect for each of these variables was significant. Those with more favorable preexisting attitudes toward agricultural biotechnology had higher mean scores on attitudes toward argument quality. Similarly, those who were high in issue involvement had higher mean scores on attitudes toward argument quality. The frame alone also had a significant influence on attitudes toward argument quality. Although the hypothesis was not fully supported, visual inspection of the means table suggested that subjects who received the *health* frame and were high in issue involvement with more positive preexisting attitudes provided the highest mean score for attitudes toward argument quality. Conversely, subjects who

received the *economics* frame and were low in issue involvement with less positive preexisting attitudes indicated the lowest mean score for attitudes toward argument quality.

Hypothesis 2 was similar to Hypothesis 1, but examined the second dependent variable: *Attitudes toward likelihood to publish information presented in a positively valenced message will differ significantly as a function of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame.* Hypothesis 2 was not supported. The interaction of issue involvement, preexisting attitude toward agricultural biotechnology, and message frame did not have a significant three-way interaction. Also, no main effects were found for any of the independent variables.

Hypothesis 3 compared subjects in each of the message treatment conditions: *Subjects who are high in issue involvement and are presented with the scientific progress frame will have more favorable attitudes toward argument quality than those who are low in issue involvement and receive either the economics or health frames.* Hypothesis 3 was partially supported.

Findings indicated that a two-way interaction of message frame and issue involvement was not significant, but the main effects for each of these variables was significant. Those who were high in issue involvement had higher scores on attitudes toward argument quality. The message frame alone also influenced attitudes toward argument quality. Visual inspection of the means table indicated that the mean attitudes toward argument quality score was highest for subjects exposed to the *health* message frame who were high in issue involvement. The hypothesized group of subjects exposed to the *scientific progress* message frame with high issue involvement had the next highest attitudes toward argument quality score.

Hypothesis 4 also compared recipients of the three message frame conditions and postulated that: *Subjects who have more positive attitudes toward agricultural biotechnology and*

are presented with the scientific progress frame will have more favorable attitudes toward argument quality than those who have less positive attitudes toward agricultural biotechnology and receive either the economics or health frames. Hypothesis 4 was partially supported.

Although the two-way interaction was not significant between message frame and preexisting attitudes toward agricultural biotechnology, the main effects were significant for each variable on attitudes toward argument quality. Those who had more positive preexisting attitudes toward agricultural biotechnology had higher scores on attitudes toward argument quality. The message frame alone also influenced attitudes toward argument quality. Visual inspection of the means table, found that for subjects who had more positive attitudes toward agricultural biotechnology, the mean score for attitudes toward argument quality score was highest for subjects exposed to the *health* message followed by the hypothesized group of subjects exposed to the *scientific progress* message frame.

Hypothesis 5 focused only on subjects who received the *scientific progress* frame and stated: *For those who receive the scientific progress frame, subjects who are high in issue involvement will have more favorable attitudes toward argument quality than subjects who are low in issue involvement.* Hypothesis 5 was not supported because an independent samples t-test found no significant difference between high and low issue involvement groups for those exposed to the *scientific progress* frame.

Hypothesis 6, which focused only on the subjects exposed to the *health* frame, stated: *For those who receive the health frame, subjects who are low in issue involvement will have more favorable attitudes toward argument quality than subjects who are high in issue involvement.* Hypothesis 6 was not supported. For subjects who received the *health* frame, an independent samples t-test found no significant difference between high and low issue involvement groups.

Hypothesis 7 examined the various independent variables' ability to predict attitudes toward argument quality and postulated that: *A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the scientific progress frame will explain the greatest variance in attitudes toward argument quality.* Hypothesis 7 was supported. The multiple linear regression model with message frame, issue involvement, and preexisting attitudes toward agricultural biotechnology was significant and explained 14.1% of the variance in attitudes toward argument quality. The beta weight for preexisting attitudes toward agricultural biotechnology was .33, which means that for each unit increase in preexisting attitudes, the score on attitudes toward argument quality increased by .33 ($t = 5.68, p = .00$). In addition, the beta weight for issue involvement was .18 meaning that with each unit increase in issue involvement score, attitudes toward argument quality increased by .18 ($t = 3.21, p = .00$).

Hypothesis 8 examined the various independent variables' ability to predict attitudes toward the second dependent variable of likelihood to publish and stated: *A combination of issue involvement, preexisting attitudes toward agricultural biotechnology, and the scientific progress frame will explain the greatest variance in likelihood to publish the information.* Hypothesis 8 was supported. Although the multiple linear regression model with message frame, issue involvement, and preexisting attitudes toward agricultural biotechnology was significant, it only explained 3.3% of the variance in attitudes toward likelihood to publish. In this model, preexisting attitudes toward agricultural biotechnology was a significant predictor of attitudes toward argument quality. The positive beta weight of .18 ($t = 2.70, p = .01$) means that with each unit increase in preexisting attitudes, the score on attitudes toward argument quality increases by .18.

Implications

The results of this study provide several significant theoretical and practical implications. Prior studies have researched framing messages within the ELM framework by comparing positive and negative frames and found that positive frames were more effective in persuading individuals with low issue involvement than the use of negative frames (Maheswaran & Meyers-Levy, 1990; Donovan & Jalleh, 2000). The current study explored the use of three positively valenced message frames and found that issue involvement and preexisting attitudes toward agricultural biotechnology influenced attitudes toward argument quality, but had little impact on likelihood to publish. These findings further the empirical work to examine framing and the ELM, and contribute to the agricultural communications discipline by illustrating how agricultural communicators can effectively utilize frames to improve media coverage and public awareness of agricultural issues.

In previous ELM studies, argument quality was not a commonly researched construct (Areni & Lutz, 1988). However, argument quality is an important part of the persuasive communication process because it can influence thoughts and which route to persuasion is utilized (Petty & Cacioppo, 1996). The current study treated attitudes toward argument quality as a dependent variable because it was necessary to gain a better understanding of how communicators identify argument quality, which can then be applied to produce more effective persuasive messages. Based on the results of this study, the frames did differ in terms of the subjects' attitudes of argument quality. Certain frames (*health* and *scientific progress*) were viewed as higher in perceived argument quality, which indicated that the frame can promote attitudes toward argument quality because some frames are more salient for certain communicators. This implies that in order to improve media coverage of certain topics,

practitioners should pay attention when tailoring the news messages to develop those that are most “attractive” for the intended audience.

Within the ELM, issue involvement is a measure of how much importance message recipients give to a persuasive message (Petty & Cacioppo, 1979). When issue involvement is high, people are more likely to dedicate cognitive effort to develop opinions of the issue and evaluate the issue-relevant arguments (Petty Cacioppo, & Goldman, 1981). In the present study, the mean issue involvement score indicated a skew toward higher issue involvement and no difference was found between those categorized as low or high issue involvement on their attitudes toward argument quality. In cases such as this, when issue involvement is already at a high level, it is important to utilize messages that contain issue-relevant arguments to support evaluation of the persuasive communication.

Results of this study suggest that while frames do make a difference in terms of attitudes toward argument quality, they are not solely responsible for the likelihood information will be published. The mean for the dependent variable of likelihood to publish might have been lower than expected because whether or not something is published is often not a straightforward decision. This may be attributed to where the topic of agricultural biotechnology currently is within the issue-attention cycle. Other agricultural issues are taking precedence during this election year such as the farm bill, food safety, and alternative fuels. The mean may also be low because many other factors influence a message’s news value including human interest, prominence of the issue, number of people affected, controversy or conflict, uniqueness, proximity, timeliness, and locality (Shoemaker & Reese, 1991). The message frame alone may have some impact on drawing journalists’ attention (Dunwoody, 1992), but the results of the

current study found that the frame is not solely predictive of whether or not something may be presented in the media.

In the data analysis process, the inability to find significant three-way interactions between message frame, issue involvement, and preexisting attitudes toward agricultural biotechnology illustrated the difficulty in developing frames that are salient for the intended message recipient. Although the message frames developed *a priori* were deemed identifiable and salient during the message development and testing process with a panel of experts and individuals who are responsible for developing messages as a part of their professional careers, subjects did not always associate the intended frame with the one they received. However, *post hoc* analysis for the three-way ANOVA with the subject-identified frame was significant, which indicates that how message recipients interpret the frame was more important than how the frame was intended to appear. This implies that communicators who develop messages with specific frames may have difficulty in tailoring them appropriately in order to reach their audience and be perceived by that audience as the intended frame.

In further *post hoc* analysis, preexisting attitudes toward agricultural biotechnology made a difference in attitudes toward of argument quality for those who received the *health* and *economics* message frames, but not for recipients of the *scientific progress* frame. This implies that preexisting attitudes toward a topic can have an impact on how certain frames are judged for argument quality. Also, examination of the less positive/more positive groups for preexisting attitudes toward agricultural biotechnology found a significant difference in their attitudes toward the message topic of peanut allergen research. Subjects who had more positive preexisting attitudes toward agricultural biotechnology indicated significantly more favorable attitudes toward the message topic than subjects who had less positive preexisting attitudes. This

further illustrates the important role message recipients' attitudes have on the evaluation of persuasive messages.

Need for cognition was examined during *post hoc* analysis and was found to be a significant predictor of attitudes toward argument quality when included in a regression model with issue involvement, preexisting attitudes toward agricultural biotechnology, and message frame. However, the issue involvement and preexisting attitude variables were stronger predictors of attitudes toward argument quality and further justify identifying these audience member characteristics as they influence how persuasive messages are evaluated.

Members of the two communication organizations (AAEA and NASW) differed significantly in their issue involvement, preexisting attitudes toward agricultural biotechnology, attitudes toward argument quality, and likelihood to publish. Members of the organizations are all communicators, but these findings imply that they do vary in key characteristics that may influence how they interpret positively framed messages. It may be more difficult to persuade general science writers, who may have less favorable opinions about agricultural biotechnology, to publish information that is presented with the use of positive frames. In fact, *post hoc* analysis to explore the message frames' influence on attitudes toward argument quality and likelihood to publish for members of each organization found significant differences between the two groups. Members of AAEA consistently indicated more favorable attitudes toward argument quality and likelihood to publish for each message frame. Although the topic of peanut allergen research extends beyond production agriculture and incorporates agricultural science, NASW members were still less favorable in their evaluations of the framed messages when compared to AAEA members. Overall, the *health* frame received the most favorable scores on attitudes toward argument quality and likelihood to publish, which implies that this message frame may be the

most effective way to communicate about new agricultural technologies, including biotechnology.

The factor analysis procedure indicated that the issue involvement index contained two subscales – affective issue involvement and cognitive issue involvement (Zaichkowsky, 1994). These subscales indicate that perceptions of issue involvement are based on both rational and emotional evaluation. The attitudes toward argument quality index was also examined using factor analysis, which identified two subscales defined as the newsworthiness index and the seven-item argument quality index. This finding implies that the index requires additional refinement to identify what items best describe how media professionals form attitudes toward argument quality.

Limitations

The exploratory nature of this study provides the opportunity for future research in the areas of framing within the ELM, persuasive communication development, and agricultural communication, but several limitations do exist. The first limitation is that results are limited to members of the two organizations (AAEA and NASW) that comprised the accessible sample. Members of these organizations may differ from other communicators due to selection bias that encouraged them to join the organization. These subjects were also all rather high in issue involvement, which could be attributed to the self-selection nature of the survey where only those who were somewhat interested in or involved with the topic of peanut allergen research mentioned in the pre-notice letter and e-mail announcement would feel compelled to complete the study.

Although this sample was more appropriate than using a surrogate population, the sample was difficult and time-consuming to access. The response rate of 24.8% was similar to other studies of journalists and communicators through the use of online surveys, but it still presents a

potential for nonresponse error. Chapter 4 addressed this potential for error through the comparison of early and late responders, which were similar for the key independent variables and most of the demographic characteristics. Chi-square tests did find a significant difference for the membership (AAEA or NASW) and the news organization category of “communication department.” The difference in membership was anticipated because AAEA members were expected to have higher levels of issue involvement with reporting food and natural resource topics. The difference in “communication department” respondents may be attributed to the option to select more than one news organization (to accommodate freelance writers). Some respondents may have not identified with this category while others may have selected this with another response option. This does indicate potential response error that should be addressed in future research.

Another limitation of the study was the subjects’ identification of the *scientific progress* frame as the *health* frame. The identification of the message frame as *health* may be justified because the topic of peanut allergies can be classified as a health issue. Prior studies examining the use of frames in persuasive communication have focused on positive versus negative frames (Maheswaran & Meyers-Levy, 1990; Donovan & Jalleh, 2000). However, negative frames are not always available for the persuasion topic and other frames may be better suited to communicate the intended message. In this current study, the distinction between the *health* and *scientific progress* frames was not evident to subjects although the manipulation check conducted during message stimuli testing found the frames to be distinguishable. This limitation illustrated the difficulty in developing message frames *a priori* and encourages the future study of how communicators identify and define intentionally developed message frames.

This study used a one-time only exposure to the message frame. Strong attitudes are resistant to change and require repeated exposure to persuasive messages to influence change through the persuasion process (Perloff, 2003). The effect of the frames in this study were measured based on a single exposure, whereas repeated exposure over an extended amount of time would potentially discover a more significant influence of message frame on attitudes.

The research instrument was designed to be as concise as possible, but it still required approximately 20 minutes to complete. Efforts were made to decrease the length of the questionnaire by removing repetitive questions and index items that would improve alpha reliability coefficients. The online questionnaire also included a progress bar so respondents knew their progress through the instrument. Despite these efforts, several respondents failed to answer every question or complete the final pages with the need for cognition index and additional demographic questions. Several respondents commented that the survey was too long or they did not have time to complete it. These obstacles were anticipated so important demographic questions were included at the beginning of the instrument and efforts were made to decrease the number of questions before respondents received their assigned message frames. Future surveys of this audience should place important questions at the beginning and explain why longer indexes are included in the instrument.

Finally, the use of an online survey could be viewed as a limitation due to potential self-selection for those who are more comfortable completing an online survey. However, journalists and communicators are increasingly utilizing the Internet and e-mail to do their jobs (“No One’s Yelling ‘Copy’ Anymore,” 2001; Trumbo et al., 2001; Duke, 2002) indicating a familiarity with this technology. Dillman (2007) noted that online or Web surveys are the latest development in survey research and are becoming more frequently utilized. Conducting this study online allowed

subjects to receive the message frame as they often would from an online news room or e-mailed press release.

Recommendations

Recommendations for Theory and Future Research

Results from this study suggest several areas of future research. From a theoretical perspective, additional research to connect framing to the ELM should be conducted to examine the development of persuasive communication messages. The results of this study found that the *a priori* defined message frames did not have a significant interaction with issue involvement and preexisting attitudes toward agricultural biotechnology on attitudes toward argument quality or likelihood to publish. However, when the subject-identified frames were considered, they did have a significant interaction. This result should be further examined to discover how researchers develop and embed message frames in persuasive communication messages and how the intended audience interprets these frames.

In the current study, subjects had difficulty distinguishing between the *health* and *scientific progress* message frames. Further research should explore if the difference is indeed negligible or if it is only the case for the message topic utilized in the study. This research could also expose subjects to all message frame stimuli so they can evaluate the appropriateness of each frame to meet their preferred style of communication. Additional research should utilize the tested message frames (*health*, *economics*, and *scientific progress*) with other agricultural topics to explore their effect on attitudes toward argument quality and likelihood to publish. In particular, the effectiveness of the *health* message frame in producing more positive attitudes toward argument quality should be further examined by applying it to other agricultural topics. This future research direction could also explore what other types of positively valenced frames

can be used with agricultural science issues such as biofuels and food safety, which have been covered in the media recently.

When forming attitudes toward argument quality, subjects relied more on preexisting attitudes toward agricultural biotechnology than issue involvement. The influence of attitudes should be examined through further investigation to explore how these attitudes affect persuasive communication in other areas of agriculture. Also, issue involvement for subjects was rather high in this study so additional research is needed to examine issue involvement when it is low to explore what persuasive techniques and message frames are most effective.

Future research should analyze the qualitative data collected in the current study through the thought-listing technique to examine the elaboration component of the ELM. This study did not examine which route to persuasion was utilized, but further research could examine what impact message frames have on encouraging the central or peripheral route to persuasion. This data analysis would also explore the methodological feature of using online surveys to collect open-ended responses. Subjects' responses to these items where typing was necessary should be compared to traditional thought-listing procedures that requires handwriting on a paper instrument.

Additionally, more research is needed to further test and refine the argument quality index with respect to how media representatives develop perceptions of message quality. This area of research should examine how news writers construct argument quality and test it as a dependent factor. Factor analysis with the data in this study indicated two subscales for the argument quality index, which need to be further tested with larger samples. Furthermore, the issue involvement index was found to contain two subscales through factor analysis procedures. These

subscales should be used to perform exploratory analysis of the data to determine what, if any, significant influence each has on other variables in the study.

Recommendations for future research also include examining how agricultural communicators develop persuasive messages and what frames are most effective for various topics. This study examined one area of agricultural science, agricultural biotechnology, while many other topics are available for examination. Further investigation of the process agricultural communicators utilize to develop persuasive messages would highlight effective methods and improve the discipline.

Recommendations for Practitioners

In this study, issue involvement and preexisting attitudes had an important influence on the persuasion process. An individual's issue involvement can impact the ability of a persuasive message to develop supportive or contrary thoughts in regard to a message topic. Also, the attitudes one has prior to receiving a persuasive message affect how the message arguments are interpreted. To produce the most effective persuasive communication messages, practitioners need to understand these characteristics about their audience members. It may be difficult to change the issue involvement or preexisting attitudes, but the persuasive messages can be adjusted over time to be more effective.

This study found that how communicators develop message frames is not always consistent with how message recipients interpret these frames. For practitioners, this means that more attention should be paid to the development of message frames that are consistent with the messages' intentions. When charged with communicating scientific information to the media, communicators need to tailor the messages so they are viewed as higher in argument quality that will encourage journalists to pay attention to the information.

As mentioned in Chapter 1, the STEP program at the University of Florida is an example of an effort to improve the dissemination of scientific results to a broader audience. The use of online technology to do so is an effective method to reach journalists and other interested audience members. As the results of this study found, respondents indicated e-mail was their preferred method to receive press releases, followed by websites. With this preference in mind, practitioners need to make an effort to develop e-mail lists of contacts for press releases and incorporate the information within the text of the e-mail, not as an attachment. Additionally, emphasis should be placed on how the message is framed within the press release to encourage recipients to read it and utilize the information in subsequent communication.

Based on the results of this study, when developing communication messages, agricultural communicators need to examine how they frame agricultural topics and explore the use of the *health* frame. Most consumers are well removed from the agrarian lifestyle and view agriculture as only a source of food. This heuristic should be nurtured by addressing the health angle of agricultural topics. The media attention given to natural and organic foods today has made health more salient for consumers and driven their desire to know more about what they eat.

It may also be necessary for agricultural communicators to utilize more than one message frame for a particular topic depending on the intended receiver. Issue involvement and preexisting attitudes are individual difference variables and communicators will be more effective in having their messages used if they are able to tailor them, through the use of frames, to effectively reach segmented audiences. The opportunity to positively frame agricultural science topics, especially those that are controversial, in a way that encourages their adoption would do much to improve the public's awareness and understanding of agricultural issues.

Conclusions

This study examined the interaction of issue involvement, preexisting attitudes toward agricultural biotechnology, and message frames on attitudes toward argument quality and likelihood to publish. How persuasive messages are framed influences attitudes toward argument quality, which is related to the amount of cognitive processing undertaken and the route to persuasion utilized with the ELM. While issue involvement and preexisting attitudes are harder to change, agricultural communicators can place emphasis on the development of effective message frames that promote agricultural issues, including those that are more controversial agricultural science topics such as agricultural biotechnology.

The results of this study indicate potential for agricultural communicators to utilize persuasive communication to influence attitudes toward argument quality. While the likelihood to publish information remains a complex decision-making process, communicators can be proactive in making their messages more attractive to those who make the decision to include information in the media by paying attention to how messages are framed.

When tailoring persuasive communication messages, practitioners still need to be cognizant of their audience's individual differences and use this information to develop effective messages and communication strategies. There will never be "one right way" to present scientific information and constant attention is needed to produce messages that are most effective.

APPENDIX A
PRE-NOTICE LETTER

Name
Title/Organization
Address
City, State Zip

April 30, 2008

Dear [insert first and last name]:

As a communicator, you have the responsibility to choose topics that are important and relevant for your audience. Currently, the topic of reporting on science-related issues is of particular importance as our society is increasingly reliant on advances in science and technology. In an effort to better understand how findings related to the development of an allergen-free peanut should be communicated, it is imperative to gain more knowledge of your opinions and perceptions of communication efforts.

To help gather this valuable information, you have been randomly selected to participate in a brief online survey. In a few days, you will receive an e-mail from me with a link to an online survey. The e-mail will be sent to [insert address here]. (Please check your junk mail or Spam filter if you do not receive this e-mail in the next few days.)

If you would like to access this survey now, you can enter the following Web address:

LINK

The results of this survey will be used to enhance communication efforts in areas related to science. Your response is crucial to the success of this study and will make a significant impact in better understanding communicators' opinions and preferences regarding information about scientific advances. The results will be kept confidential and reported in summary form only. If you have questions, please feel free to contact me at the phone number or e-mail address listed below.

Thank you in advance for your participation and contribution to this study.

Sincerely,

Courtney Meyers
Ph.D. Candidate
(352) 392-4680
cameyers@ufl.edu

Figure A-1. Pre-notice letter

APPENDIX B E-MAIL CONTACTS

Message testing e-mail

Hello member of the ACE Writing SIG,

My name is Courtney Meyers and I am a doctoral candidate at the University of Florida. For my dissertation, I am conducting a research project to gain a better understanding of how communicators perceive information regarding research being done on the development of a hypoallergenic peanut.

In preparation for my study, I have developed an online press release about this research project. As a professional communicator, your input is greatly appreciated in evaluating this message to ensure it is an effective presentation of the information.

You were randomly selected from the ACE Writing SIG to receive a short survey. Please click the link to be connected to a web-based questionnaire that contains the press release and a series of questions regarding its content. This survey will take no more than 10 minutes to complete and I would greatly appreciate your feedback by next Friday, March 21.

LINK

Thank you in advance for your feedback in the development of this communication material.

Sincerely,
Courtney Meyers

Survey contact e-mail**Subject: Brief Survey from University of Florida**

Hello. My name is Courtney Meyers, and I am a doctoral candidate at the University of Florida currently researching communicators' opinions and perceptions of how findings about the development on an allergen-free peanut should be disseminated. Hopefully, you received a letter in the mail informing you of this study.

You have been randomly selected to participate in a brief online survey. The results of this survey will be used to enhance communication efforts related to peanut allergen research. Your response is crucial to the success of this study and will make a significant impact in better understanding communicators' opinions and preferences regarding information about scientific advances.

I realize your time is incredibly valuable so this survey has been designed to be as concise as possible and should take no more than 20 minutes to complete. Your responses will remain confidential and all results will be presented in summary format. If you have any questions, please contact me at 352-392-4680 or cameyers@ufl.edu.

To fill out the survey, please click on the link below:

LINK

Thank you for your feedback. It is much appreciated and will contribute significantly to this research project and the future improvement of communication efforts.

Sincerely,
Courtney Meyers

Text for follow-up e-mail

Subject: Reminder: Brief Survey from University of Florida

Date

Last week a link to a web-based questionnaire was sent to you seeking your opinions and perceptions of how findings about the development on an allergen-free peanut should be disseminated.

If you have already completed the questionnaire, please accept my sincere thanks. If you have not, please do so at your earliest convenience. I am especially grateful for your help because it is only by asking people like you to share your experiences that we can enhance communication efforts in related areas.

In case you have misplaced the original e-mail, a link to the survey is provided below.

LINK

Thank you again for your participation.

Sincerely,
Courtney Meyers

APPENDIX C INSTRUMENT

Informed Consent

Dear Participant: We (Dr. Tracy Irani and Courtney Meyers, both of the Agricultural Education & Communication Department at the University of Florida) are conducting research through a Web-based questionnaire to gather communicators' opinions and perceptions of how findings about the development on an allergen-free peanut should be disseminated. The purpose of this study is to gain a better understanding of how similar topics should be communicated. This survey will take less than 20 minutes to complete. Your identity will remain confidential to the extent provided by law. Your participation is completely voluntary; you have the right to withdraw consent at any time without consequence. There are no known risks associated with this study and there is no compensation or other direct benefit to you for participation.

If you have any questions about this research, please contact the study supervisor, Dr. Tracy Irani at irani@ufl.edu or 352-392-0502 ext. 225. For questions regarding your rights as a research participant, please contact the UFIRB at 352-392-0433, IRB #2008-U-0296.

By selecting the "Next" button you agree that you have read this statement and are aware of your rights.

If you have trouble accessing the survey...

In order to fully access the survey, you may need to enable JavaScript and cookies on your computer. If you have trouble moving past the next page, please return to this page and click on the link below to find instructions on how to enable JavaScript and cookies. We apologize for any inconvenience. We sincerely appreciate your input for this study.

[Enable JavaScript and Cookies](#)

Demographics

1. Are you a member of the following organizations?

	Yes	No
American Agricultural Editors' Association	☐	☐
National Association of Science Writers	☐	☐

2. Which of the following best describes your current position?

- ☐ Freelance
- ☐ Work for single publication as a writer
- ☐ Work for single publication as an editor
- ☐ Public relations practitioner or account executive
- ☐ President
- ☐ Owner
- ☐ Other (please indicate here if you work for a radio or television station)

3. What type of news organization do you work for? (mark all that apply)

- ☐ Daily newspaper
- ☐ Weekly newspaper
- ☐ Weekly magazine
- ☐ Monthly magazine
- ☐ Online journalism
- ☐ Broadcast journalism (TV/Radio)
- ☐ Communication division/department
- ☐ Public relations agency

Other (please specify)

Reporting

Mark one number for each line below that best describes how you feel about the phrase: "I feel that reporting on food and natural resource issues is..." Each line has a different set of adjectives to gather your opinions about the phrase.

Numbers "1" and "5" indicate strong feelings, numbers "2" and "4" indicate weaker feelings; and box "3" indicates that you are undecided.

I feel that reporting on food and natural resource issues is...

1.

Important			Undecided		Unimportant
1	2	3	4	5	
☐	☐	☐	☐	☐	

2.

Boring			Undecided		Interesting
1	2	3	4	5	
☐	☐	☐	☐	☐	

3.

Relevant			Undecided		Irrelevant
1	2	3	4	5	
☐	☐	☐	☐	☐	

4.

Exciting			Undecided		Unexciting
1	2	3	4	5	
☐	☐	☐	☐	☐	

5.

Appealing			Undecided		Unappealing
1	2	3	4	5	
☐	☐	☐	☐	☐	

6.

Fascinating			Undecided		Mundane
1	2	3	4	5	
☐	☐	☐	☐	☐	

7.

Worthless			Undecided		Valuable
1	2	3	4	5	
☐	☐	☐	☐	☐	

8.

Involving			Undecided		Uninvolving
1	2	3	4	5	
☐	☐	☐	☐	☐	

9.

Not Needed			Undecided		Needed
1	2	3	4	5	
☐	☐	☐	☐	☐	

Attitudes

Indicate your attitude about the phrase: "I feel agricultural biotechnology is..." Each line has a different set of adjectives to gather your opinions about the phrase.

Numbers "1" and "5" indicate strong feelings, numbers "2" and "4" indicate weaker feelings; and box "3" indicates that you are undecided.

I feel agricultural biotechnology is...

1.

Foolish			Undecided		Wise
1	2	3	4	5	
☐	☐	☐	☐	☐	

2.

Unacceptable			Undecided		Acceptable
1	2	3	4	5	
☐	☐	☐	☐	☐	

3.

Unfavorable			Undecided		Favorable
1	2	3	4	5	
☐	☐	☐	☐	☐	

4.

Wrong			Undecided		Right
1	2	3	4	5	
☐	☐	☐	☐	☐	

5.

Bad			Undecided		Good
1	2	3	4	5	
☐	☐	☐	☐	☐	

6.

Negative			Undecided		Positive
1	2	3	4	5	
☐	☐	☐	☐	☐	

Attitudes

1. Indicate how much you agree or disagree with each statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. Both large and small farmers reap economic benefits from agricultural biotechnology.	☐	☐	☐	☐	☐
b. Agricultural biotechnology lacks adequate testing.	☐	☐	☐	☐	☐
c. Agricultural biotechnology is natural. The process is just faster and more precise than traditional plant breeding.	☐	☐	☐	☐	☐
d. Biotech foods are in development that will improve human health.	☐	☐	☐	☐	☐
e. Agricultural biotechnology will help to feed the world's rapidly expanding population.	☐	☐	☐	☐	☐
f. Biotech crops improve water quality, requiring fewer chemicals than traditional crops.	☐	☐	☐	☐	☐
g. Biotech foods pose unforeseen health risks.	☐	☐	☐	☐	☐

Message

Please take the next few minutes to read a brief press release.

Click on the link below and the press release will open in a separate window. Please read it carefully. When you are finished, please re-read the press release then select the "Next" button on this screen to continue.

[Press Release](#)

Message Evaluation

Now we have a few questions to ask you about the message you just read.

1. We are interested in the thoughts and feelings that went through your mind as you read the press release. Please type your thoughts and feelings in the six blank boxes below. Please list only one thought or feeling in a box, but you do not need to fill in all the boxes. Just list whatever thoughts you had after reading the press release.

Thought 1	
Thought 2	
Thought 3	
Thought 4	
Thought 5	
Thought 6	

2. Indicate your response to the following question.

	Not Important At All 1	2	Moderately Important 3	4	Very Important 5
How important was the press release message to you personally?	☐	☐	☐	☐	☐

3. Indicate your response to the following question.

	not at all motivated 1	2	somewhat motivated 3	4	very motivated 5
How motivated were you to read the press release?	☐	☐	☐	☐	☐

*** 4. In your opinion, how would you classify the dominant theme/frame of the press release? This theme/frame can be defined as a recurring or implicit idea that is dominant in the message.**

- ☐ Health
- ☐ Economics
- ☐ Scientific progress
- ☐ Don't know

5. Please indicate your response to the statement below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe this press release is newsworthy.	☐	☐	☐	☐	☐

Attitudes about Press Release Topic

Indicate your attitude about the phrase: "I feel peanut allergen research is..." Each line has a different set of adjectives to gather your opinions about the phrase.

Numbers "1" and "5" indicate strong feelings, numbers "2" and "4" indicate weaker feelings; and box "3" indicates that you are undecided.

I feel peanut allergen research is...

1.

Foolish			Undecided		Wise
1	2	3	4	5	
☐	☐	☐	☐	☐	

2.

Unacceptable			Undecided		Acceptable
1	2	3	4	5	
☐	☐	☐	☐	☐	

3.

Unfavorable			Undecided		Favorable
1	2	3	4	5	
☐	☐	☐	☐	☐	

4.

Wrong			Undecided		Right
1	2	3	4	5	
☐	☐	☐	☐	☐	

5.

Bad			Undecided		Good
1	2	3	4	5	
☐	☐	☐	☐	☐	

6.

Negative			Undecided		Positive
1	2	3	4	5	
☐	☐	☐	☐	☐	

Message Evaluation

Mark one number on each line below that best describes how you feel about the press release message you just read. Each line has a different set of adjectives to gather your opinions about the press release.

Numbers "1" and "5" indicate strong feelings, numbers "2" and "4" indicate weaker feelings; and "3" indicates that you are undecided.

The press release message I just read was...

1.

Insignificant			Undecided		Significant
1	2	3	4	5	
☐	☐	☐	☐	☐	

2.

Irrelevant			Undecided		Relevant
1	2	3	4	5	
☐	☐	☐	☐	☐	

3.

Untimely			Undecided		Timely
1	2	3	4	5	
☐	☐	☐	☐	☐	

4.

Not Believable			Undecided		Believable
1	2	3	4	5	
☐	☐	☐	☐	☐	

5.

Low Quality			Undecided		High Quality
1	2	3	4	5	
☐	☐	☐	☐	☐	

6.

Not Convincing			Undecided		Convincing
1	2	3	4	5	
☐	☐	☐	☐	☐	

7.

Not Credible			Undecided		Credible
1	2	3	4	5	
☐	☐	☐	☐	☐	

8.

Unreasonable			Undecided		Reasonable
1	2	3	4	5	
☐	☐	☐	☐	☐	

9.

Inconclusive			Undecided		Conclusive
1	2	3	4	5	
☐	☐	☐	☐	☐	

10.

Inaccurate

1



2



Undecided

3



4



Accurate

5



Publish Intent

1. Mark one number below that best describes how you feel about each of the following questions. Number "1" indicates highly unlikely and "5" indicates highly likely. Number "3" is unsure or undecided. Number "6" indicates not applicable.

	Highly Unlikely		Undecided		Highly Likely	Not Applicable
	1	2	3	4	5	6
a. How likely would you be to utilize the information in the press release to write or publish a story?	☐	☐	☐	☐	☐	☐
b. If you saw this story on the AP wire service, how likely would you be to publish the information?	☐	☐	☐	☐	☐	☐
c. How likely would you be to seek out a source to write or publish a story based on the information in the press release?	☐	☐	☐	☐	☐	☐

2. Which of these is your most preferred method for receiving press releases?

- ☐ Fax
- ☐ Mail
- ☐ Email (as an attachment direct to you)
- ☐ Web site (as a downloaded file)
- ☐ RSS Feed

Other (please specify)

Need for Cognition

1. Indicate how much you agree or disagree with each statement below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. I would prefer complex to simple problems.	☐	☐	☐	☐	☐
b. Thinking is not my idea of fun.	☐	☐	☐	☐	☐
c. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.	☐	☐	☐	☐	☐
d. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.	☐	☐	☐	☐	☐
e. I find satisfaction in deliberating hard and for long hours.	☐	☐	☐	☐	☐
f. I only think as hard as I have to.	☐	☐	☐	☐	☐
g. I prefer to think about small, daily projects to long-term ones.	☐	☐	☐	☐	☐
h. I like tasks that require little thought once I've learned them.	☐	☐	☐	☐	☐
i. The idea of relying on thought to make my way to the top appeals to me.	☐	☐	☐	☐	☐
j. I really enjoy a task that involves coming up with new solutions to problems.	☐	☐	☐	☐	☐
k. Learning new ways to think doesn't excite me very much.	☐	☐	☐	☐	☐
l. I prefer my life to be filled with puzzles that I must solve.	☐	☐	☐	☐	☐
m. The notion of thinking abstractly is appealing to me.	☐	☐	☐	☐	☐
n. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.	☐	☐	☐	☐	☐
o. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.	☐	☐	☐	☐	☐
p. It is enough for me that something gets the job done; I don't care how or why it works.	☐	☐	☐	☐	☐
q. I usually end up deliberating about issues	☐	☐	☐	☐	☐

even when they do not
affect me personally.

Additional Demographics

1. What year were you born? Please type the entire year (YYYY).

2. What is your gender?

☐ Male

☐ Female

3. What is the highest level of education you have completed?

☐ Less than High School

☐ High School Graduate or GED

☐ Some College

☐ Two-year Associate's Degree

☐ Four-year Bachelor's Degree

☐ Graduate or Professional Degree

4. How many years have you worked as a professional in the communications field?

☐ less than 3 years

☐ 3-5 years

☐ 6-10 years

☐ 11-15 years

☐ 16-20 years

☐ more than 20 years

5. What is your publication's circulation?

☐ under 4,999

☐ 5,000-9,999

☐ 10,000-19,999

☐ 20,000-34,999

☐ 35,000-49,999

☐ 50,000-74,999

☐ more than 75,000

☐ don't work for single publication

☐ don't work for print publication (please provide viewership or listenership number)

6. Any additional comments about this survey (optional).



Thank you for completing the survey!

APPENDIX D

MESSAGE VERSIONS

FOR IMMEDIATE RELEASE

NEWS RELEASE

Contact: Staff Writer, (352) 555-0000

Recent study explores possibility of allergen-free peanuts

Gainesville, Fla. – Mary spends extra time reading food package labels, examining ingredient lists and asking restaurants what type of oil they use to fry their food. She is not doing this just for curiosity; she takes these steps to save her life.

Mary represents the 1.5 million people in the United States who suffer from peanut allergies. Peanut allergies are the most common cause of life-threatening allergic reactions and account for 80 percent of fatal or near-fatal allergic reactions each year.

Research in The Journal of Allergy and Clinical Immunology reported that the prevalence of peanut allergies in the United States doubled from 1997 to 2002, and the amount of people diagnosed with peanut allergies continues to increase.

To assist those people who avoid peanuts due to health concerns, a University of Florida scientist is investigating the possibility of a hypoallergenic peanut. Maria Gallo, associate professor in the department of agronomy, is researching what characteristics of peanuts cause people to be allergic and how to create a peanut that is edible even for those with peanut allergies.

Through the examination of cultivated peanuts, Gallo found one of the peanut genes indicating the presence of an allergen protein was altered. Peanut proteins act as the instigators of an allergic reaction within humans, which can range from minor discomfort such as a skin rash to a more serious reaction such as difficulty breathing and death.

In her study, Gallo exposed blood from peanut-allergic patients to the altered peanut proteins and found that the blood did not respond in the typical way.

“In other words, the patient’s antibodies did not recognize one of the proteins. So in theory, they are not as allergic to this protein,” Gallo said.

No treatment exists for peanut allergies and most people do not outgrow the allergy over time. The only way to avoid an allergic reaction is to avoid products that may contain peanuts. The list of barred foods include peanuts and peanut butter and other foods those that might contain peanuts such as cakes, pies, breakfast cereals, Asian foods, salad dressings, barbeque sauce, ice cream and chocolate bars.

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Figure D-1. Health Message

FOR IMMEDIATE RELEASE

NEWS RELEASE

Contact: Staff Writer, (352) 555-0000

Work on allergen-free peanuts may lead to substantial economic growth for \$800 million peanut industry

Gainesville, Fla. – In economics, supply and demand is a basic principle that addresses the interaction between what is available and what consumers want. A University of Florida scientist is conducting research that may increase the consumer demand for peanuts through the development of allergen-free nuts.

“My understanding is that despite the increase in allergies, the sale of peanuts has remained relatively stable,” said Maria Gallo, associate professor in the department of agronomy. “So, the expectation is that a safer peanut will most likely boost sales.”

Gallo is researching what characteristics of peanuts cause people to be allergic and how to create a peanut that is edible for those with peanut allergies. With nearly 2 percent of the U.S. population suffering from peanut allergies, this research could lead to a hypoallergenic peanut that would be safe for a larger number of consumers.

In the United States, the average person consumes more than 6 pounds of peanuts and peanut products each year. However, approximately 1.5 million people avoid peanuts entirely due to life-threatening peanut allergies. The availability of hypoallergenic peanuts may lead to increased demand and should promote significant growth in the peanut commodity market, Gallo said.

Peanut production in the United States contributes more than \$800 million to the economy each year.

With the support of peanut commodity groups and industry representatives, Gallo is looking to classical plant breeding and genetic engineering as ways to alter the peanut's genetic structure in order to make it hypoallergenic.

Although the development of an allergen-free peanut may be five to 20 years away, Gallo said consumers and the peanut industry should benefit from the production of a hypoallergenic peanut.

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Figure D-2. Economics Message

FOR IMMEDIATE RELEASE

NEWS RELEASE

Contact: Staff Writer, (352) 555-0000

Scientific breakthrough may lead to allergen-free peanuts

Gainesville, Fla. – Using the latest applications in biotechnology, a scientist at the University of Florida is paving a new path to explore the possibility of allergen-free peanuts.

Maria Gallo, associate professor in the department of agronomy, is researching what characteristics of peanuts cause people to be allergic and how to create a peanut that is edible for those even with peanut allergies. This research provides progress in an area of peanut research that, up to this point, had remained unknown, Gallo said.

One of the first to explore this research area, Gallo is looking to classical plant breeding and genetic engineering techniques to alter the peanut's genetic structure in order to make it hypoallergenic. These new peanuts would be genetically modified to contain genes that code for proteins that do not cause allergic reactions.

"What we wanted to do was to investigate from the plant side of the equation," Gallo said. In the first step of this research process, the examination of cultivated peanut, Gallo found an alteration in one of the peanut genes that signifies the presence of an allergen.

"In a limited study, using blood from peanut allergic patients that was exposed to the proteins, they did not respond the same way," Gallo said. "In other words, the patient's antibodies did not recognize one of the proteins. So in theory, they are not as allergic to this protein."

This discovery provides the opportunity for future investigation of the allergic characteristic of peanuts, which is due to the proteins within peanut genes. These proteins can cause a range of allergic reactions from minor discomfort such as a skin rash to more serious reactions such as difficulty breathing and death.

Nearly 2 percent of the U.S. population suffers from peanut allergies, but exactly why and how people become allergic is still under scientific investigation.

If what Gallo has found holds true in future studies, this research provides a step forward in the search for a viable alternative for those who have peanut allergies. In fact, hypoallergenic peanuts may be available to consumers in the next five to 20 years.

Gallo said the next step requires additional research to ensure that alteration of the genes does not change other peanut characteristics and that these peanuts are safe for all people to eat.

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Figure D-3. Scientific Progress Message

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BIOGRAPHICAL SKETCH

The author was born Courtney Alyssa Wimmer, in 1980, in Fort Scott, Kansas. She grew up in Fulton, a small town in southeastern Kansas. Her family includes her parents, Gary and Sheila Wimmer; a twin sister, Gaea; a brother, Zach; and a younger sister, Sheridan. Her interest in agricultural communications was nurtured through involvement in FFA at Jayhawk-Linn High School in Mound City, Kansas, where she graduated in 1999.

In August 1999, Courtney began her college career at Kansas State University majoring in agricultural communications and journalism. While at K-State, Courtney worked for the International Grains Program and was active in Agricultural Communicators of Tomorrow. She graduated *summa cum laude* in May 2003.

In August 2003, Courtney continued her education at the University of Arkansas in Fayetteville. While earning her master's degree in agricultural and extension education, she spent a summer working for the Scottish Agricultural College in Edinburgh, Scotland. Courtney was selected as the Dale Bumpers College of Agricultural and Life Sciences Master's Scholar when she graduated in 2005.

After completing her master's degree, Courtney married Daniel Meyers in June 2005, and moved to Gainesville, Florida, to pursue her doctoral degree in agricultural communications. Courtney received the University of Florida Alumni Academic Fellowship to support her doctoral education in the Department of Agricultural Education and Communication. During her degree program, Courtney taught or assisted classes in technical writing, Web and print design, and communication campaign development. She conducted research in Web and print material evaluation, scholarship of teaching and learning, media coverage of agricultural issues, and public awareness of agricultural topics.

Courtney and her husband welcomed their first child, Isabel Ashley, in 2008. In August, Courtney will begin her faculty career at Texas Tech University as an assistant professor in the Department of Agricultural Education and Communications, teaching agricultural communications.